

# Ball Lightning in the wider context

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*Note : BL = Ball Lightning ; BOL = Ball Of Light*

### *Abstract*

The use of 'Ball Lightning' as a label identifying a category of anomalous phenomena is justifiable on grounds of convenience, but only so long as we bear in mind it is simply a *label*, not a *definition*. Even as it is, many accounts of BL contain inconsistent and paradoxical features, so that we may reasonably wonder if we are including a diversity of phenomena under the same label.

Examination of some of these paradoxical features reveals apparent similarities with other luminous phenomena not generally supposed to be BL. This in turn suggests that study of this wider range of phenomena may help us, on the one hand, to decide what should and what should not be defined as BL ; and on the other, to move toward a comprehensive taxonomy of anomalous luminous phenomena, of which BL is probably a sub-category.

The immediate need is for, first, data collection and second, analysis of observed phenomena : these would include identified categories such as earthquake lights, mountain lights, St Elmo's fire, feux follets, plasma-vortices &c as well as ball lightning itself ; and unidentified individual observations such as those at Hessdalen, Yakima, Piedmont &c.

These operations should be conducted without preconceived constraints as to what constitute appropriate parameters. For example : While BL is reasonably supposed to be a purely physical phenomenon, there are indications that some luminous phenomena (including some cases provisionally listed as BL) display puzzling indications of interaction with their human observers. Eventually, a decision will have to be made whether to disqualify any luminous phenomenon displaying such features as a candidate for BL, or to confront the possibility that BL, too, may present such features. For the time being, however, we should postpone evaluation and concentrate on building up our collection of data on a non-restrictive basis.

The broadly-held consensus is that

'Ball lightning is a luminous, globular mass whose diameter is usually in the range 10-40cm with a duration of between one and 10 seconds.' (1)

The use of 'Ball Lightning' as a label identifying a category of anomalous phenomena is justifiable on grounds of convenience, but only so long as we bear in mind it is simply a label, not a definition. Even as it is, many accounts of BL display inconsistent and paradoxical features, so that we may reasonably wonder if we are including a diversity of phenomena under the same label.

No one can concern himself with BL for a moment without realising that the primary problem is to identify what constitutes BL and what does not. Even someone whose interest is solely in BL as a meteorological phenomenon must be concerned to locate the boundaries which set it apart from other phenomena. However, I suspect that most of us are interested in the BOL phenomenon as a whole ; and if we have defined our research field specifically as BL, that is partly because it is the only type of BOL to have been awarded an official label and a measure of scientific status. It is academically respectable - or at least relatively so - to admit to an interest in BL, whereas if we admit to an interest in the ball-of-light phenomenon in its entirety we run the risk of exposing ourselves to suspicions of naive amateurism. Nevertheless, as I hope to show, there are good grounds for considering the possibility that the BOL phenomenon, taken as a whole, presents a serious challenge to our understanding of the physical universe, and offers a way in which we may hope to increase that understanding.

Whatever approach we take to the BL phenomenon, we discover in a very short space of time that a great many observations cannot be covered even by the generous umbrella-description which opens this paper. Many BOLs are more than 40cm in diameter, many more have a life-span which far exceeds 10 seconds. The following case, for example, is conventional in most respects, in that it seems to relate to a typical thunderstorm-related BL, but the object's life-span far exceeds what we have been taught to expect :

A rural policeman in France, about 6.30 in the evening, was suddenly aware of a bright light which he saw emanated from a ball of light which was dropping at great speed from a cloud to the earth. Curious, he started to walk towards it, when he saw another light rising from the summit of a tree, emitting bright flashes of light. It shone for about *a quarter of an hour*, then gradually faded and vanished. Inspecting the tree, later, it was found that the lightning had pierced the interior of the tree for about 3m, then descended by the exterior as far as the ground, then travelled round to the far side of the tree and climbed it again. At the foot of the tree was a small hole, about 4cm in diameter, which retained some noticeable heat for an hour and a half. (2)

Such observations of prolonged duration are exceptional, but by no means rare ; consequently we must either exclude such observations from our field of study - an exclusion for which there is no scientific justification - or we must stretch our parameters of duration to accommodate them.

And so it is with each and every parameter generally attributed to the BL phenomenon. It is no exaggeration to say that every feature which is conventionally ascribed to BL must be extended or revised, and in some cases quite contradicted, by observations which have been made involving BOLs which in other respects appear to conform to the consensus model. A proportion, no doubt, may be discounted on grounds of witness error, but many are supported by a body of testimony which cannot easily be dismissed.

Examination of some of these paradoxical features reveals apparent similarities with other luminous phenomena not normally supposed to be BL. This in turn suggests that study of this wider range of phenomena may help us, on the one hand, to decide what should and what should not be defined as BL ; and on the other, to move toward a taxonomy of the whole spectrum of anomalous luminous phenomena, of which BL is probably a sub-category.

Let us start by making a rapid survey of the most prominent categories of BOLs. This is not intended as a comprehensive catalogue, simply as a sampling to indicate the range and complexity of the material which challenges us. In the same spirit, I shall pick out, in each category, one or two examples which give us some idea of how such an observation stretches any conventional idea of BL.

For convenience' sake I have categorised these as to whether they seem (1) to be atmospheric in nature (2) or to occur in an aerial context (3) or in a marine context (4) or in a terrestrial context (5) or in association with humans. But these distinctions are only for convenience, and there is no reason to suppose that each constitutes a separate phenomenon or group of phenomena. In our present state of ignorance of the BOL phenomenon, we cannot with finality define any specific manifestation as, say, atmospheric or terrestrial. Not only may it be the result of an interaction between atmospheric and terrestrial forces, there is also the possibility that both atmospheric and terrestrial forces are themselves triggered by some underlying force or over-riding factor - for example, to take one seemingly far-fetched explanation which has nevertheless been seriously put forward, the sun-spot cycle.

A further caveat. First, although most of these observations were made by competent people in conditions which allowed for reasonably accurate observation, and though many of them were corroborated by, say, a ship or an aircraft's crew, the fact remains that they are ultimately no more than anecdotes resting on human testimony ; and as such, should be received with the usual caution. On the other hand, the examples presented here are generally representative of a very substantial bulk of similar material, so that to cast doubt on any one long-duration observation, for example, would nevertheless leave us with many others to be accounted for. One has only to look at the catalogues of William Corliss's *Sourcebook Project* (3) to be reminded what a rich diversity of extraordinary observations continue to puzzle the student of nature.

## **1 Observations associated with atmospheric factors**

Our starting-point must be BL observations associated with thunderstorms : it seems that the same forces which generate lightning in its various 'conventional' forms also generate, occasionally and for unknown reasons, the phenomenon which has become known, though possibly inaccurately, and certainly with a dismaying lack of precision, as ball lightning. BL is at one and the same time the paradigm for any discussion of BOLs, and also its central enigma.

However, there are other types of BOL which also seem to originate in the atmosphere. Perhaps the most interesting are those which Dr Meaden supposes to be generated by air vortices (4). Apart from their apparent association with the crop circle phenomenon, and the probability that they are responsible for a proportion of so-called UFO observations, these **vortex-BOLs** are some of the few species of BOL which can boast some scientific support for the fact of their existence. They therefore represent a welcome point of access to the phenomenon as a whole. They are not BL ; but they may be distant cousins.

What appears to present during this type of event is exemplified by this case : Chapelle-Taillefer, around 02.30, 19.03.1967 : Three witnesses saw an orange/red light, estimated diameter 10m, descending from the sky at about 45°, terminating its path in a field a few metres away from them. It was egg-shaped, with the pointed end upward, and was surrounded by a halo of white sparks 5m long which were brighter than the ball itself. There was sound, compared by witnesses to a car's starter or to an old windmill. The ball seemed to sink into the ground in a burst of sparks, about 15 seconds after the observation commenced. A fourth witness saw the ball pass overhead. Next day a circular patch was found in the field. (5)

Although alternative explanations for this case were offered, Meaden invites us to agree 'how well the details of the story fit the requirements I have spelled out for the new plasma-vortex'.

One of the problems with the UFO phenomenon has always been how to reconcile the apparent trustworthiness of an observer with the implausibility of what he tells us. Meaden's theory enables us to see that witnesses can have made good, reliable observations of objects which were indeed flying and unidentified, but which can be attributed with some confidence to a hitherto unclassified natural phenomenon. His suggestion has therefore been warmly welcomed by many serious ufologists (eg 6) who accept Meaden's suggestion that

the plasma vortices may be relevant to the UFO problem. By this I mean, first and foremost, those observations of luminous phenomena which hover in the sky or descend towards or away from the ground but which, for lack of scientific recognition, have been given the sobriquet 'UFO'. I also include those further reports which involve electrical failures to cars, unexplained effects on animals and humans, etc, in connection with proximal light forms of unknown origin. (5)

## 2 Observations associated with aerial factors

A great many intriguing accounts exist of aerial phenomena which might be classified as BOLS : a problem here is that there are so many strange things moving about in Earth's atmosphere - hence, of course, the extraordinary rise and sustained hold on public interest manifested by the so-called UFO phenomenon. To the range of orbiting heavenly bodies, and occasional celestial visitors such as comets, meteors and meteorites, man has added a proliferation of artificial satellites, and we cannot deny that it is possible - though perhaps we may not think it very probable - that extraterrestrial visitors have made their contribution.

Just what proportion of UFO observations we should take under the BOL umbrella is a wide and complicated question. Here and now, let us confine ourselves to one specific manifestation, which has the especial merit that it occurred before the 'age of the flying saucer' (generally taken to have been ushered in by the Kenneth Arnold sighting in July 1947). The so-called **Foo Fighters** of World War Two were paradoxical both in their behavior and in the circumstances of their manifestation : for example :-

On 22.12.1944, an American bomber crew over Germany saw two very bright lights climb towards them from the ground. On reaching the plane they levelled off and stayed on the plane's tail for about 2 minutes. They were huge, bright and orange-coloured ; they seemed to be under perfect control. (7)

Winter, 1944 : During a mission over Austria and Yugoslavia, USAF bomber pilot William Leet reported a BOL which suddenly appeared alongside his plane 'like a light switch being turned on'. Estimated distance from the wing-tip, 75 to 100m laterally and about 5m to the rear of it. It seemed two- rather than three-dimensional, like the amber light of a traffic signal, but not like any earthly light : estimated diameter 3m. It stayed with the plane for about 45-50 minutes, then suddenly was gone. It was seen by all the crew : 'Our gunners wanted to shoot it down, but I ordered them not to. I told them if it was hostile, it would already have shot us down. Let's try to figure out what it is, I told them.' (8b)

A duration of 45+ minutes far exceeds the life-span of any scientifically accepted BOL phenomenon. Leet himself, in his 1979 book (8a), is sufficiently influenced by current UFO thinking to ask 'Could it possibly have been a space craft piloted by advanced beings from another world ?' and speculates that the BOL could have somehow protected his plane from enemy attack. However, he does not propose this suggestion with any conviction, and really it does no more than express his bafflement at the experience.

The explanation which comes immediately to our minds will no doubt be a plasma created by the aircraft's progress through the atmosphere : but if so, it is curious that only one wing-tip created such a plasma, and it is hard to account both for its extended duration and for its intense luminosity in the night sky (there was nothing for it to reflect from) - it was bright enough for Leet and his crew to suppose their plane had been picked up by German searchlights. But they saw no beams coming from the ground, one crew member reported 'a blinding glare that seemed to come from above' and more than one spoke of intense heat which may or may not have been associated with the BOL.

This is just one instance of several such reports, mainly from the European theatre of war but also from the Japanese. But the most puzzling feature of the Foo-fighter phenomenon is that it was for the most part limited to a very brief historical period - two or three years of WW2 - and even then occurred only occasionally, in the course of operations in the German and Pacific airspaces. Because the historical context is so clearly a determining parameter, we are constrained to look to the historical circumstances for an explanation. I think it is legitimate to speculate that some kind of artifact, generated by military activities or the associated hardware, was interacting with natural phenomena to produce the phenomenon.

Dr Richard Haines, in his important study of reports made by pilots during the Korean war (9), includes many BOL-type observations. For example :

10.02.52 : Lieut. Perez, flying a B-29 bomber, reported a globe-shaped object, estimated size 1m across... color resembled the sun, a light orange, occasionally changing to bluish ...the outer edge appeared to be fuzzy and it seemed to have an internal churning movement like flames or fiery gases...it came in on the same level as the B-29, remained in the same relative position for approx one minute, then receded on the same path, fading in the distance...'

If this is a naturally occurring phenomenon related to mechanical flight, why does it not occur more frequently ? There are occasional references to similar phenomena in a non-military context, such as the following :

April 23, 1964. Crew of an aircraft flying over Bedford, England, reported 'a loud bang and a whitish-blue flash of light. A ball of blue light the size of a football appeared on the starboard wing tip. It vanished in two seconds (11)

but the great majority of accounts - particularly those in which a long duration is cited - relate to military flying : we have to ask, are there any special features of military flying which distinguish it from civilian flying ? The 2-second duration of the incident just cited falls a long way short of Leet's 45+ minutes : can we be sure that we are confronted by the same phenomenon in both cases ? Then again, while military aircraft are different in many respects from civil aircraft, they are surely not so *very* different ? The wartime aircrews are liable to be in a state of unnatural tension - but there are many circumstances in civilian flying which would also lead to unusual stress and provoke the same psycho-physiological responses. Yet they do not seem to trigger the same BOL reports.

It seems beyond doubt that the foo-fighter phenomenon is a real one, in the sense that it comprises a number of observations which are more-or-less similar to one another and more-or-less distinct in some respects from other comparable phenomena. As such it vividly demonstrates one dimension of the BOL challenge. This is that, in the case of the foo-fighter as in that of many other categories of BOL, *even if we recognise its similarities to other BOL phenomena, even if we successfully ascribe it to a natural cause, there remain contextual circumstances associated with it which require elucidation* : these must either be shown to be illusory, or be taken into account in the eventual explanation.

### 3 Observations associated with marine factors

The best-known BOL phenomena associated with the sea are reports of the manifestation popularly known as **St Elmo's fire**, which is sufficiently well-understood for us simply to note its possible relevance to other phenomena.

But there are also a number of observations of BOLs apparently originating from beneath the surface of the sea : for example :

12.11.1887 : off the Newfoundland coast, the crew of the steamer *Siberian* saw a huge ball of fire rise from the sea and soar into the air. It floated against the wind and headed towards the ship. Just when a collision seemed certain, it changed course, shot into the sky, and disappeared within a few minutes. (11)

Though sometimes listed as an Unidentified Submarine Object, there is no reason to suppose that this was anything other than a natural phenomenon : but what kind of natural phenomenon ? To hypothesise a submarine volcano is by no means to explain what exactly the fireball was made of, and how it acquired the momentum to *float* against the wind. (Clearly, it is more strange that something should float slowly against the wind than that it should be propelled violently against it.)

Andres Alfaya, in the course of his duties as a Cuban security officer, investigated a number of anomalous submarine incidents which defy conventional explanation. For example :

On 07.06.1965, the fishing-boat of Archibaldo Centeno was for 15 minutes accompanied, under the water, by a luminous object, larger than his boat, and which he could not escape by manoeuvring his vessel. (12)

Though the Cuban authorities ascribed this and other such incidents to U.S. naval activity, some of them seem to exceed the limits of what is conceivable, even allowing a generous margin for secret American naval technology. On the other hand, there are problems also with natural explanations : Corliss has outlined many of these difficulties (3).

### 4 Observations associated with terrestrial factors

BOLs of terrestrial origin have been the most *extensively* studied for the simple reason that they are the most *easily* studied. Yet extensive study has not succeeded in satisfactorily explaining any of them.

Even the type of BOL which probably has the longest historical record of all - the *feu follet* - continues to elude us, though from time to time a scientist is kind enough to provide us with what he claims to be a 'definitive' explanation. Folklore provides us with a wealth of anecdotal material : here is one, taken virtually at random, which illustrates the enigmatic quality of the phenomenon :

A very intelligent and well-balanced girl I know told me how, one night as she was walking home only an hour or so after dark, she saw a Will-o'-the-wisp [the popular name in the British Isles] moving slowly along the bog parallel with the road and not 50m away. As soon as she stopped to look at it, it suddenly changed course and began to come straight towards her, increasing its speed. This rather shook her determination to examine it with scientific coolness, so she hastily moved down the road a bit. To her consternation it changed direction too and still came straight for her, now crossing the soft bog as fast as a man could run on a road. This proved to be too great a strain on her morale and she promptly turned and made for home with

all the speed she could. To this day she is convinced that it was directed by a real intelligence. (13)

This anecdote, one of thousands which tell a more-or-less similar story, includes the characteristic observation by the witness that the feu follet seemed to be behaving intelligently. However, even if we discount this as a subjective impression, there remains the fact that the duration of the phenomenon defies most of the scientific explanations that have been proposed. When there was an outbreak of 'fireballs' near Saratoga, Texas, in 1961, Dr Edwin Hays, head of the biology department of the nearby Lamar State College of Technology, offered the 'conventional' explanation of marsh lights - 'swamp gas' ignited by spontaneous combustion. Curtis Fuller, the editor of *Fate* magazine, responded :

We would like to challenge Dr Hays and every other proponent of this old chestnut of a theory to prove it. A common scientific criticism of psychic phenomena is that it is not repeatable under laboratory conditions. Well, we challenge the swamp gas theorists to produce a little swamp gas under laboratory conditions, ignite it spontaneously, and produce their own little fireballs that go bouncing merrily along for minutes at a time. (14)

There is more than one difficulty with the marsh-gas explanation, but the most serious objection is that of duration. Feux follets have been observed for periods up to one hour, sometimes even more. If they had remained in the same location, we could hypothesise that they were sustained by a steady supply of fuel from that particular portion of the terrain - a natural source of methane gas or some such. But this is not the case : on occasion, they have been followed, moving in a seemingly purposeful manner, over a distance of a kilometre or so, as in the following account :

In October 1938 I had developed an interest in the folklore of the Ozarks. I had been told that if I went to a certain old sawmill pond after dark I would stand a chance of seeing one of the local spooks - a ball of blue light rising from the ground and drifting into the woods. With the fellow who had told us about it my dad and I went to the millpond one evening carrying an old lighted barn lantern. We had been there for maybe 20 minutes when around the end of the pond about 10m away, a small blue light began to form near the ground. It was about the size of a softball and its colour was a clear cornflower blue. Dad picked up the lantern and we started toward the strange light. By the time we were 3m from it, it was about 1m off the ground and had expanded to the size of a basketball. Its colour was still clear and bright but now more a robin's egg blue. We were less than 2m from the light when it started to move away. Our companion picked up a piece of a tree limb and shoved it into the ground to mark where the light had first appeared.

We started following it down the road. It had now taken up a swinging motion : the high point of the arc was about 1.3m above the ground and the low maybe 0.2m. At its lowest point it gave enough light for us to see the white sand of the road. The light went south about 200m to a one-room country schoolhouse. There it left the road, moved over to the building and passed from front to rear along the north side. We followed it along the back side of the school and back toward the road where it started south again. This time it went to a fork in the road, took the lefthand road and went about 600m to the gate on a lane leading to an abandoned two-room log house.

The light went over the gate and by the time we opened it and passed through, the light had reached the house. We watched it make a complete trip around the house and then it went inside through the only door. We could see it passing the windows and through the cracks between the logs. It came out after a few minutes and started back toward the road. At this time the light passed within 0.3m of me, moving smoothly about 1m above the ground. It emitted a low soft hum like the 60-cycle hum of an electrical transformer.

The light took pretty much the same route back to the pond without the detour around the schoolhouse. We were 6-7m from it when it reached the tree limb sticking out of the ground. Hovering there for perhaps half a minute, it became smaller and darker in size. When it had reduced to the size it was when we first saw it, it settled into the sand and was gone.

I don't think this was ball lightning nor was it the classic will-o'-the-wisp. To this day I have no idea what it was - but three of us saw it and followed it for most of an hour. And it did return to its point of origin. (15)

Nothing we know of has the capability to sustain itself over so long a period, let alone travel over so long a distance. The return to its place of origin is a feature which the narrator is right to emphasise, for this is particularly hard to explain in terms of any natural phenomenon. Even if we set aside the behavioral characteristics of the object, its physical properties are sufficiently baffling. Moreover, though some details suggest that this was a feu follet of some kind, no convincing explanation has ever been given, as Fuller justly points out, as to why marsh gas should spontaneously ignite in the first instance.

A very interesting category of BOLs of terrestrial origin are the **mountain lights** and so-called **spook lights**, which are seen recurrently in specific locations, often intermittently over a period of centuries which rules out such simplistic explanations as poorly observed automobiles or railway trains. An additional curious feature of such BOLs is that rarely has any observer succeeded in approaching them. Other types of BOL - feux follets and BL, for instance - have been observed at very close quarters - often within touching distance : the question, why mountain lights should be so exceptionally shy, constitutes an anomaly within an anomaly.

From the investigation point of view, the most interesting category of all BOLs must be that which emerges from the recent recurrent near-terrestrial observations at three locations in particular - **Piedmont**, in Missouri (see 16) ; **Yakima**, in Washington State (17) ; and **Hessdalen** in Norway (18). All three have in common, not only the fact that they involved low-level BOLs over an extended period of time within a relatively limited region, but that - because of these facts - they were able to be studied not in retrospect only, as spontaneous one-of-a-kind observations by casual witnesses who chanced to see them, but over a period of here-and-now time. Moreover, the observers were not random members of the public, but persons with some degree of knowledge and expertise, and in some cases scientific qualifications : who were prepared to see them rather than being taken by surprise : and who were frequently armed with cameras and other appropriate scientific equipment. Consequently, the phenomena have been registered on instrumental records, and there exist many hundreds of photographs which constitute our best objective evidence for the existence of a BOL phenomenon unrecognised by current science.

Unfortunately, though we know more about these three sets of lights than we do about any other kind of BOL except BL itself, that is not saying very much. In the 1984 series of observations at Hessdalen, for example, though 188 observations were recorded, only two of them were made in conditions which left no reasonable room for doubt that an anomalous event had occurred.

Nevertheless, the fact that these observations are of higher-than-average quality does at least broaden our data-base. At Yakima, for example, the observations were made in a largely forested area requiring continuous surveillance, which meant that there were observation posts manned 24 hrs of the day and night, in particularly strategic locations - few observers can ever have been so well-situated for their task ! Experienced observers were able to discount the usual natural phenomena, so when they tell us of something they considered to be anomalous, they have every right to be given a serious hearing.

Some reports say structured objects were seen, but most sightings - and all the available photos - show only BOLs. Nevertheless, one 1972 witness described an object the size of a two-floor house ; one reported that the object responded to her flashlight ; a farmer who saw one of the same lights reported that it affected the instruments on his tractor when it passed overhead. And so on....

Another category of terrestrial BOLs is **earthquake lights**, a category of particular interest because several researchers have taken it as the starting-point for their experimental work. The first recorded sighting of earthquake lights dates from 373 BC in Greece, and their existence is generally accepted, if not yet fully understood. Derr & Persinger have proposed 'a number of potential mechanisms, including tectonic strain, exoelectron emission, streaming potential, EM excitation of water droplets, and the fault zone as an EM waveguide' (19). The fact that these experts feel the need to list such a catalogue of possible causes, most of which are probably less than solidly established in their own right, is an indication of the fragile state of earthquake light research. Moreover, it is in respect of earthquake lights that the question of ultimate origin is seen to be most baffling. For example :

In May 1951, the Rock Solano and Contra Costa districts of California were shaken over a two-week period by 'blasts, explosions, shocks and jars' which commenced around 9 am and occurred periodically throughout the day. The authorities ascribed them to old explosives being destroyed by the military, but there are many problems with this explanation, notably the fact that a few weeks later the explosions began again. This time a naval base was affected, so the authorities began to take the incidents more seriously. Later in the year, in the same area, fireballs were reported : in one incident, a falling luminous object ignited a 200m row of trees, 7m above the ground, though no wreckage or ground trace was found. Some months later, there was a series of electrical storms, in the course of which many instances of BL were reported.

Such a succession of events, some of them seemingly terrestrial in origin, others manifestly atmospheric, and at least one apparently extraterrestrial, could conceivably be ascribed to coincidence : but the possibility that they were all related must also be considered, especially in the light of cases such as the next (20) :

St Helens, Lancashire, England : 27.07.1938. A blinding ball of blue light fell on Bold Colliery, causing an explosion which killed one and injured two. Not very remarkable, except that two weeks later a similar ball of bluish light fell just 3km away. (21)

Given the random trajectories of meteorites, given the distance the earth had moved and rotated during those two weeks, this repeat fall would be, if nothing else, an astonishing coincidence - sufficiently astounding for us to at least consider the possibility that there was something about the location itself which was implicated in the occurrences. But if so, the meteorite hypothesis is hard to sustain.

## **5 Observations seemingly associated with human factors**

Throughout history there have been reports of luminous phenomena seen in association with humans - notably, religious mystics. There is a massive amount of testimony to this effect, and we do not have the right to dismiss it before giving it serious attention, particularly since luminous effects have been seen in association with humans in recent times in good evidential conditions. Carlos Alvarado has reviewed a wide range of such cases : the most thoroughly studied is perhaps the 1934 case of Anna Monaro, an Italian woman who, while lying sick in a convalescent home, was seen to be giving off a bluish light from the region of her chest. (22)

Many serious commentators, while critical of other pious legends, share the feeling that perhaps there may be some substance to the reports of luminous phenomena occurring in association with religious states of mind. Of the thousands recorded, here are two examples :

Saint Gertrude of Nivelles (Belgium, 626-659) told her biographer that one day, while she was in prayer before the altar, she saw descend upon her a luminous globe which lit up the entire church. This lasted for a half-hour, then disappeared little by little.

Brother Leon of Catania would often pray in the church with a lay brother of great piety. Throughout a long period, a peasant who lived nearby saw at night a globe of light rise from the roof of the church. Astonished at the sight of this spectacle, he resolved to find out what it could be, and he saw two beautiful lights which emerged from the church and rose into the sky. More astonished than ever, he rang the bell and woke the porter of the convent. This man, who knew him, opened the church door, and they both saw, as they entered, Leon and his companion in ecstasy before the Holy Sacrament, raised up in the air : they then realised what the two lights signified. (23)

Though religious believers might accept such occurrences as miraculous, more skeptical commentators would ascribe them to pious fabrication ; and doubtless many of them are indeed no more than that. But if all the entire collection of such stories are fiction, it is extraordinary that so many story-tellers should choose this particular form of manifestation. We may surmise that, if they are fabricated, it is because there exists a folklore belief that light phenomena somehow symbolise another kind of enlightenment ; but this still leaves open the question, how did they come to acquire that significance ?

Once again, we find that we must take into account the cultural context within which the phenomenon occurs, for two possibilities are open to us :

*First* the phenomenon is illusory, a product of the cultural context : the alleged observations are no more than fabrications generated by consensus expectation. But even if this should be the case, it could be interesting to know why fabrication should take this particular form, and that in itself might be relevant to our study.

*Second*, the phenomenon is real ; but if so, the fact that it manifests in a particular cultural context requires to be accounted for.

A feature of BL reports which may be relevant in this context is the apparent attraction of BL for human beings combined with a reluctance to do them any harm. To give just two examples from the many that have been reported :

France, November 1898 : A fireball appeared in a room where a girl was sitting, crossed the floor towards her, circled round her in a spiral, then darted up the chimney and exploded out of doors.

France, August 1895 : A fireball passed through a farmhouse room, ignoring two people, passed through the floor (making a hole as it went) into the sheep-fold below where it killed five sheep (though with no sign of burn or wound) yet left unharmed the sheep-boy who was with them (24)

Once again, though, we are denied the chance to establish a positive across-the-board parameter for the BOL phenomenon. For while it is true that BOLs *rarely* harm people, and also true that there exist a number of cases in which the BOL seems deliberately to be avoiding causing harm to people, it is also true that cases do exist in which people are harmed by BOLs. Does this mean that the phenomenon is different ? Or that the witnesses involved are in some way different - one is resistant, another vulnerable, for some unknown biophysical reason (or even because one enjoys divine protection while the other doesn't, who can say ?) ? Or is it a question of circumstances - maybe BOLs are harmless when humidity is low, dangerous when humidity is high ? And so on... there are so many possible conditioning factors.

Perhaps the most remarkable, because the best attested, instance of BOLs appearing in association with humans is the case of the **Egryn Lights**, seen in Wales in association with a religious revival in that country in 1905. These lights aroused sufficient interest to attract the attention of observers both from the national press and from interested bodies such as the *Society for Psychical Research* : and it is difficult to discount the many reports, many of them made by skeptics who came reluctantly to accept the testimony of their own eyes where they had previously rejected what they had been told by others.

Low-altitude aerial lights were seen on several occasions by numerous observers hovering over chapels where a prominent preacher, Mrs Mary Jones, was scheduled to appear, or where future converts lived. The conclusion, that the lights were physically real, and that they were associated with Mary Jones, can be avoided only by denying the validity of the testimony ; and that is not easy to do, considering the large number of independent witnesses.

But if we accept the observations as real and substantially accurate, it is hard to see how we can avoid the logical consequence - that the lights were somehow generated by Mary Jones herself. This is so contrary to received experience that most of us would prefer to reject the testimony, however well confirmed. We could derive some comfort from the fact that there existed a long-standing tradition of anomalous lights observed in the area, dating back over a century or so - long before Mary Jones' lifetime. Kevin & Sue McClure,

in their detailed study of the phenomenon (25), point out that Egryn Chapel stands near marshy ground such as might generate luminous phenomena of the *feu follet* type. In addition, Paul Devereux (26) has shown convincingly that many of the sightings occur along a prominent geological fault line, which according to his hypothesis is capable of generating short-lived luminous effects.

It is hard to dismiss these geophysical circumstances as coincidental : yet how can they be reconciled with the Mary Jones phenomenon as described by witnesses ? It is possible that naturally-occurring lights were mistakenly attributed to her, by those who wished to believe in a miracle ; but this does not seem to be borne out by the reports which are very specific. An alternative line of approach would be that Mary Jones possessed some faculty which enabled her to interact with natural forces already existing in the area. To pursue such a line of thought may seem to be going beyond legitimate speculation, but the fact is, the phenomena challenge us to account for them *somehow*.

If the Egryn lights were an isolated instance, we could dismiss it as some kind of misinterpretation, doubtless inspired by religious wishful-thinking. But such stories are to be found throughout the folklore of the world ; and in some cases, they have been witnessed by competent observers. In 1899, the traveller J Shepley Part reported from West Africa this experience :

Shortly before leaving the forest country, we were benighted one night, and our guide did not know how far we were from the town to which we were bound. We had been marching for some hours in the dark along one of the forest roads when I and others saw what we took to be a lantern in the thick bush. It was peculiar, as it moved as fast as we did. It presently came out on the track, and an attempt was made to capture the bearer, which failed, and Mr Ferguson [a native guide reputed to possess psychic powers] said we had better leave it alone. The impression I retain is as a focus of light throwing a circle of light round it, much as an ordinary stable lantern would.... As we approached, the light eluded us, and then followed the path ahead of us for some miles, and then disappeared, just outside the town we were approaching ; it moved exactly as if carried by a man. The explanation given to me was the 'double' sent out along the route to act as our guide. (27)

Indeed, the challenge of such cases grows even more disconcerting when we face the fact that many reports, of different kinds of BOL in different places at different times, also contain suggestions that some kind of human factor is, consciously or unconsciously, involved. To give just one instance :

Dr Harley Rutledge, investigating the Piedmont Lights in a mountainous region of Missouri, recorded 178 anomalous objects on 157 occasions, with independent instrumental corroboration. That alone would make his experience of the greatest value, but there is more : on at least 32 recorded occasions, he and/or his colleagues recorded a high degree of synchronicity between the movement of the object and the activity of the observers. This activity might be as physical as switching a car lamp on or off, it might be a verbal or a radio message, or it might be an unspoken thought in the mind of one of the observers. Of course there is no way of substantiating this third category ; nevertheless, if we accept the investigators' word in other respects, we must at least give them a hearing in regard to these remarkable claims. (16)

It seems likely that what is involved is a variant of the Experimenter Effect which is beginning to impose itself as a secondary problem in so many fields of research. We need not go so far as to suppose that the human subject is responsible for actually *creating* the BOL : it is enough to suppose that some kind of interaction is taking place, just as we suggested that some kind of interaction between man and nature could be responsible for the foo-fighter phenomenon, or that Mary Jones might have been unconsciously interacting with pre-existing natural phenomena to bring the Egryn Lights into existence.

I don't suppose any of us feel very comfortable with these reports, I certainly don't. Once we admit the implication of a human element, we seem to be opening the door to all kind of parapsychological and even occultist theorising. But there is no need to admit such extreme explanations. So far as the BOL event is concerned, it is only with the physiological aspects of the human involvement that we are concerned : any psychological parameters (not to speak of the parapsychological) can be set on one side unless we particularly choose to take them into account.

While the addition of the human element certainly complicates the BOL enigma, there is at the same time a positive aspect : it is possible that it could help us understand some of the other anomalous features displayed by the BL/BOL phenomena. For example, there is the fact that certain people are reported as being repeatedly the victim of lightning strikes : this is normally attributed to mathematical chance, and so it may be. But we should at least entertain the possibility that some persons are particularly liable, due to their physiological make-up, to this kind of accident :

Roy Cleveland Sullivan, a forest ranger in Virginia, survived being struck by lightning seven times during his 36-year career. He once made the remarkable statement that he could see the lightning travelling towards him. (28)

We might say that a forest ranger, by virtue of his occupation, is especially liable to such a risk, and perhaps Mr Sullivan was working in a region where lightning is particularly common. But is the same true of every one of such accounts which have been collected by the editors of *Fortean Times* ? (29). The apparent interaction between lightning and certain individuals is only one of many ways in which BOLs are said to modify their behavior in regard to humans, and this is only one of the anomalous features which merit attention, though it is perhaps the most intriguing. The BOL case file contains hundreds of accounts which for one reason or another defy pigeonholing into one or other of the categories we have been considering. At the same time, they display features so manifestly in common with BL that it would be foolish for us to ignore them.

But how far should we stretch our willingness to consider all the reported data, however remarkable ? The following case was sent to me in a private letter by a German lady who had this experience when she lost her way while climbing alone in the Bavarian Alps :

You will understand that this is rather a heavy mountain tour, but there is a good way as well up as down, but one must not miss it as I did. Having started a little late for the return, and light beginning to fade, all of a sudden I found myself in a really dangerous position. As a matter of fact one year later a young girl fell to death exactly on the spot where I realised myself to be in an almost hopeless position. All of a sudden I noticed a sort of big ball of light, and this condensed to the shape of a tall, rather chinese looking gentleman. Extraordinarily I was not a bit frightened, and also not astonished, it all seemed then quite natural to me. The gentleman bowed,

spoke a few words, led me a small path to the tourists' way, and disappeared as a ball of light. (30)

A very similar story is told by a Czech climber :

My husband and I are keen mountain climbers. One morning in 1977 we set out to climb the highest mountain in Czechoslovakia, Mount Snezka. It was a sunny day, but halfway to the peak the weather suddenly turned bad and it began to snow. Although I know the mountain well, after an hour or so it was clear that we were lost. By 3pm we were exhausted and desperate. We were now in the thick of a gale and snowstorm. Then suddenly I looked to the left and saw a big blue ball, which was very near me and shone with a clear and warm light. I was very surprised, and I must admit I was also very frightened. I shut my eyes, but when I opened them the ball was still there. I asked my husband if he could see it, but he could not. Then, when I stepped forward, the ball moved with me, then it turned to the right and moved slowly away from me. I followed it, as if hypnotised by it. My husband asked why I had changed direction and said it was the wrong way, but he followed me although he still couldn't see the ball. All the way, the ball showed us the right direction and after two hours we arrived at the town. As soon as I could see the first houses, the ball disappeared. I am convinced that it saved our lives. I cannot explain this event, but it is true. (31)

Even two such cases don't prove that anything was involved except hallucination, especially as in the second case the husband did not see the ball, which one must suppose was sufficiently visible for both to see it ! But once again, as with the occurrence of BOLs in the context of religious experience, we have to ask, why does the hallucination take this form ? Why a ball of light ? Or, when an apparition of a Chinese gentleman (a bodhisattva ?) is seen, why does it commence by manifesting as a BOL ?

Such incidents may seem to raise more questions than they resolve, and some of us may feel that they are a distraction from the main path of BOL research. But if there is a human aspect to the BOL phenomenon, it is not one we have the right to ignore.

The question arises : What can we do with this mass of variegated data ? The logical approach is to catalogue the apparent attributes, and see which (if any) are *constants*, which are periodically *recurrent*, and which, though only *occasional*, are reported sufficiently frequently to suggest that they are more than one-of-a-kind accidents, drawing our data from the entire spectrum of BOL categories. Such a catalogue should enable us to establish patterns which would provide a working basis on which hypothetical models can be constructed.

What follows is not an attempt to initiate such an analysis, simply some indications of the form it might take.

## 1 : physical parameters

We would start with such measurable - or at any rate, estimatable - parameters as *size*, *duration* and *luminosity*. It would be useful to know how wide-ranging are reports of BOLs the size of tennis balls, or of footballs, and so on. Even if we decide that those BOLs which we are content to label BL are confined to only a small segment of the band of size observations, it would be of interest to know that there exist other phenomena which share some of BL's attributes but differ markedly in size. For example, the circumstances of observation at Hessdalen enable us to determine, within broad limits, the size and luminosity of the object, and this makes possible comparison with what we know of BL.

Other attributes include, for example, *sounds* reported in association with BOL observations. Among the cases cited in this paper we have seen comparisons with an electrical transformer, a car's starter and an old windmill : would it be possible to reduce these to some kind of common denominator and so establish a rudimentary pattern ? The fact that a phenomenon generates sound immediately gives us useful information about it ; it carries the suggestion of movement or some other kind of process, which in turn carries the suggestion of development or even purpose.

## 2 : recurrent behavioral characteristics

Some behaviors are reported sufficiently often that they can be classed as recurrent ; for instance the ability to pass through walls, windows etc. Grigor'ev et al (32) have gathered 42 cases where BL penetrates through glass without damaging it, and 26 cases where it leaves a hole. In virtually every case the hole is neat and circular, sometimes with a blackened rim : evidently the glass has been melted. The authors suggest that the BOLs which leave holes in glass are also likely to be the ones which explode violently, sometimes causing substantial damage ; this would suggest that the energy stored in this kind of BOL is greater than in those which pass through glass without leaving a trace. But can we conclude that there is a clear line of demarcation between those which don't melt the glass and those which do ? Is it simply a function of the energy ? The authors themselves accept that 'a number of facts do not fit into this simple explanation', the most major one being that, rather than melting away the hole, the BOL seems to cut a hole, much as a housebreaking burglar does in order to insert his hand to turn the lock, leaving a piece of circular glass to fall onto the floor... However, none of these 'cutting' cases has been conclusively linked with BOLs, so perhaps we may be talking about two entirely different phenomena having in common only the fact that a round hole is created in glass. In yet other cases, the glass is simply broken.

The question is also worth asking, why does the BOL always look for a window to escape by ? Does it 'know' that it can get out through glass, or get through it more easily, as compared with going through the wall ? In this connection, the following case may be relevant, reported by Flammarion :

During a thunderstorm, a BOL the size of a child's head entered by the chimney of a third-floor apartment, and wandered for a while around the room, without touching or damaging anything. It then directed itself towards a vertical metal chimneypipe. At a certain point on the pipe there was a junction with another pipe ; however, since this was the warm season, the other pipe was not in place and the hole had been temporarily covered with a piece of paper. The BOL went directly to this point, somehow pushed aside the paper without damaging it, and continued its journey inside the pipe until it reached the chimneytop, where it exploded violently causing considerable damage. (2)

Here, it seems, we have on record the ability of BL to distinguish between metal and paper. Is this a one-of-a-kind instance, or are there other similar observations ?

Other cases would provide additional data of this kind, for example, the affinity for power lines, and the many cases in which BL has been reported inside aircraft (33). By gathering together these physical data, we might find that we were building up a profile of the phenomenon in terms of its reported attributes. And from its attributes we might proceed to determine its nature.

### ***3 : intangible qualities***

The testimony asserting interaction with humans, often of a seemingly intelligent nature, is only one of the more enigmatic aspects of the phenomenon. Seemingly purposeful changes of direction are also reported very frequently, giving rise to suggestions that the BOL 'knows what it is doing' or is under intelligent direction. This kind of behavior has given rise to a specific sub-section of the extraterrestrial theory for UFOs, which suggests that many small lights are in fact remotely-controlled robot scouts sent out by alien spacecraft to report, just as we send our space-probes out into space to collect data for us.

Though I personally do not feel the need to go to such lengths, we must find some way of explaining a case such as the following :

Queensland, Australia ; date unknown. A Mr Pike, walking in marshy terrain, saw a light hovering and dancing about 50m in front of him. By the time he had approached to about 20m, he could see it was a huge glowing ball, hovering about 2.5m over the ground. Suddenly, it soared to one side. The witness realised that the light was leading him into dangerously marshy ground, and halted. The light stopped too, seemed to hesitate, then glided a little closer to him, as though tempting him to follow. When he started back to his camp, the light, as though realising it had 'lost', swept away and disappeared from sight. (34)

'Leading', 'hesitating', 'tempting', 'losing' - these anthropomorphic phrases seem out of place if all we are concerned with is a natural phenomenon. Yet witnesses use them time and time again to describe their experiences ; and we must evaluate how much is due to human imagination, how much is objective fact, before we reject such testimony. We have noted two cases in which BOLs seemed to act benevolently, guiding lost travellers to safety : on the other hand, in countless tales, feux follets are accused of deliberately enticing people into dangerous situations. If Mr Pike had followed the light, he would have been led towards a dangerous chasm. Was the light really tempting him towards it ? And could this possibly relate in some way to the observation we noted earlier, that while most BOLs manage not to harm people, a few do so.

If there really is some form of interaction in progress between the light and the witness, most of us researchers would doubtless prefer it to be a purely physical one. Regrettably, we have to face the fact that physical circumstances do not, on their own, seem to be sufficient to explain the reports. If Mr Pike's object was chemically or electrically attracted to him, why did it not approach closer to him, instead of remaining at a distance? And what physical circumstances would cause it, when he turned back to camp, to abandon him instead of following him ?

On the other hand, if we begin to take into account *non*-physical parameters, how do we decide which could be relevant ?

A very significant case occurred in the Caucasus Mountains in 1978, which displays once again the affinity that BOLs have for humans, except that on this occasion the interest seems to have been far from friendly :

Victor Kavunenko was one of party of five climbers camped at around 4000m. During the night he woke with the feeling that there was a stranger in the tent. Looking out from his sleeping bag, he saw a 'bright yellow blob' floating about 1m from the ground. It disappeared into a climber's sleeping bag. The man screamed in pain. The ball jumped out and circled over the other bags, hiding now in one, now in another. 'When it burned a hole in mine, I felt an unbearable pain, as if I were being burned by a welding machine, and blacked out. Regaining consciousness after a while, I saw the same ball which, methodically observing a pattern that was known to it alone, kept diving into the bags, evoking desperate howls from the victims. This indescribable horror repeated itself many times. When I came back to my senses for the 5th or 6th time, the ball was gone. I could not move my arms or legs and my body was burning as if it had turned into a ball of fire itself. In the hospital, where we were flown by helicopter, seven wounds were discovered on my body. They were worse than burns ; pieces of muscle were found to be torn out to the bone. The same happened to three of the others : the fifth was dead, possibly because his bag had been on a rubber mattress, insulating it from the ground. The ball lightning did not touch a single metal object, injuring only people'. (35)

Even this sampling of BOL cases is sufficient to illustrate the richness of the data and the complexity of the problem of explaining them. But it is better to have too much data than too little : from an analysis of the reports, there is good reason to suppose that patterns would emerge.

But if those patterns are to be perceived, it is essential that we keep an open mind as to which parameters are of potential value. Such cases as the Egryn Lights, for example, might seem to lie outside our field of study : but they could help us to understand some of the cases in the BL literature - Egely's Hungarian Ball Lightning Observations, 1987, for example, contains some puzzling cases, such as this :

15-year old Maria Takacs and her 7-year old sister were working at needlework during a thunderstorm when a BL the size of a football entered the room. Though the younger girl was not affected, the older girl fainted and was unconscious for about 18 hours : at the hospital where she remained for half a year, cardiectesis and nervous shock were diagnosed. Against expectations, she survived, but was permanently affected by heart trouble. An interesting side-effect was that she became electro-sensitive. (36)

This seems to have been a classic BL case ; but the effect on the witness can be paralleled by many cases which are far from being classic BL cases - including, it must be said, a number of so-called UFO observations. Worse : we may find ourselves drawn into the world of psychic phenomena. Consider this case :

My elderly cook has told me that on many occasions she has awakened suddenly during the night and has seen a round or oval patch of red, or sometimes white, light on the wall of the room, which disappeared after a few minutes, but after each of these appearances a death has occurred, either in her family or among her neighbours. On one occasion the globe of light left the wall, proceeded slowly across the ceiling and descended near her bed to about the level of her eyes. The day following her son died in hospital... One night a girl was sleeping in her room, and they both saw two lights, and two deaths took place among their friends shortly afterwards... (37)

It would be a mistake to give such cases much importance, ; indeed, I dare say most of us would prefer not to take them into consideration at all. But we don't have the right to disregard them altogether, so long as there remains a possibility that one of these 'outside' cases may contain a clue which will give us insight on our more conventional cases. So we must, at the very least, be aware that such experiences are being reported. Sooner or later, however, we shall have to go farther : we shall have to decide whether to disqualify any luminous phenomenon displaying such features as a candidate for BL, or to confront the possibility that BL is only one of a range of phenomena which should be studied as a group rather than independently.

At one time, it was thought that because some people did not have white skins, they could be regarded as outside the human race : today we recognise that the pigmentation of our external tissue is of minimal significance compared with the qualities which make us all - black, white or of whatever colour - equally part of the human family.

In the same way, I think we are going to find that though BL possesses individual features which seem to distinguish it from other BOL phenomena, those features are less important than those that BL shares with some if not all of those other phenomena.

Even if we succeed in defining BL in such a way as to establish it as an individual category, we are not likely to do so by establishing a set of absolute criteria : we are more likely to achieve it by distinguishing its characteristics relative to those displayed by other members of the BOL family.

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