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Ball lightning and fireballs





Definition

Ball lightning is reported to have the following characteristics:

- it is associated with thunderstorms;
- it is luminous;
- it is roughly spherical, with a model of diameter of 20- 30 cm;
- it has a lifetime of several seconds;
- it moves independently through the air, often in a horizontal direction.

(Stenhoff, 1999)

Photographs perhaps representing ball lightnings



www.unusualresearch.com



www.conspiracyarchive.com



<http://ewp.se>



www.newscientist.com



<http://news.bbc.co.uk/>



<http://library.thinkquest.org>

Properties

Size:

Most probable value-
10 – 50 cm. Decrease
with increase of
humidity and electric
field.

Shape:

Usually seen as
spherical

Duration:

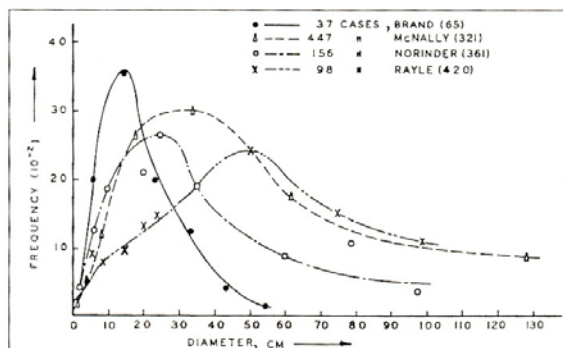
2-5 s in the sight of
observer

Environmental conditions:

Usually formation or/and
disappearance connected
with discharges of
ordinary (CG) lightning -
either before or after the
ball lightning.
In more than 50% of
reports after heavy rainfall.
Reported also indoor and
inside aircrafts.

Luminosity:

Usually bright and
uniformly illuminated.
Luminosity power
estimated to around 40 W



Distribution of ball lightning size
The Levelland Sightings Of 1957 by Antonio F. Rullán: The Ball Lightning Hypothesis
(www.temporaldoorway.com)

Properties

Color:

Usually yellow, white, red, orange, blue. Correlation between reports is very poor.

Odor:

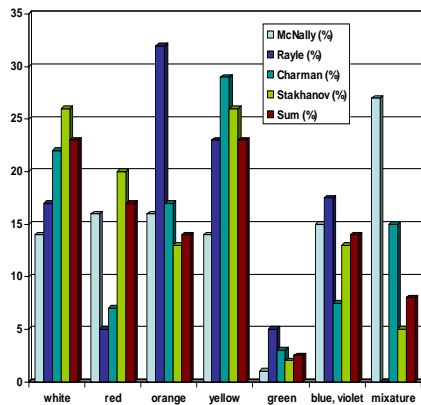
Usually without. In around 20% sharp or acrid (reminiscent of ozone, burning sulfur, or nitric oxide)

Motion:

Form clouds to near the earth, from near the earth to clouds, spiral, zigzag or random above the earth, motionless above the earth, movement between the clouds
Predominantly is horizontal motion (more than 50% of reports)
It is reported that it rotate, roll, bounce, and no so often move against the wind

Sound:

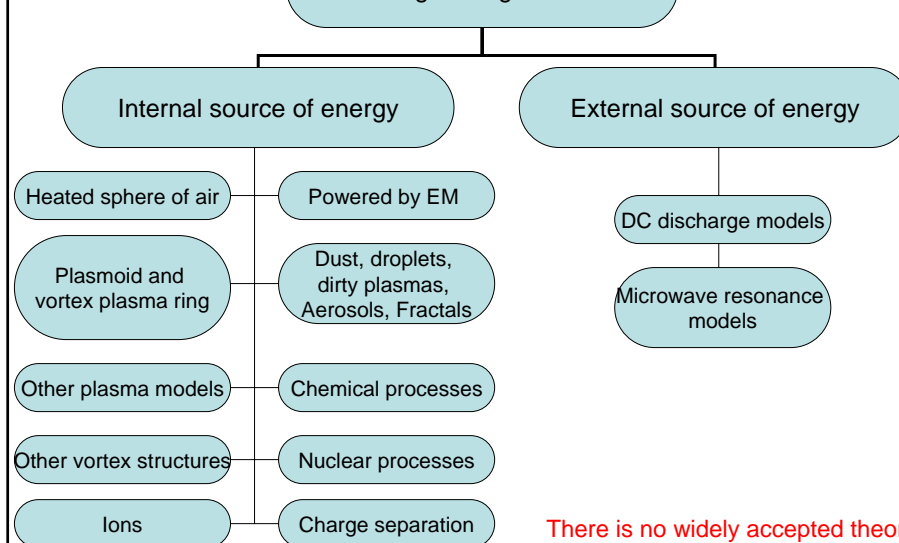
Usually only during its formation or decay, although every stage is rather silent



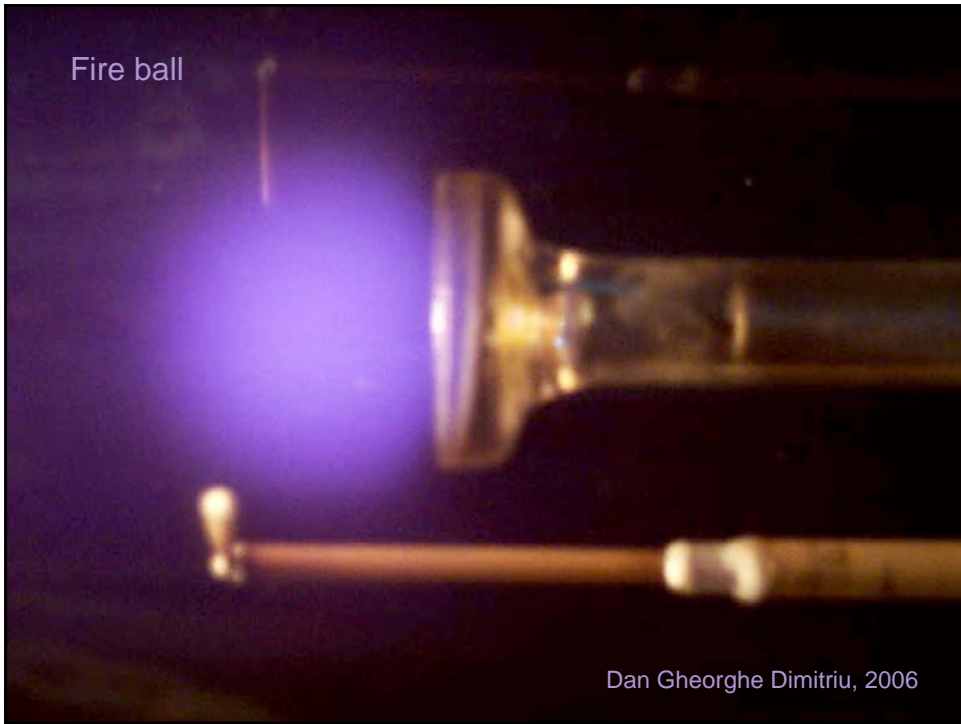
Frequency distribution of reported color (several surveys) (Simonov 1987)

Theories

Ball lightning theories

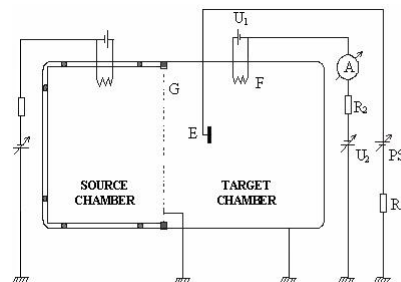
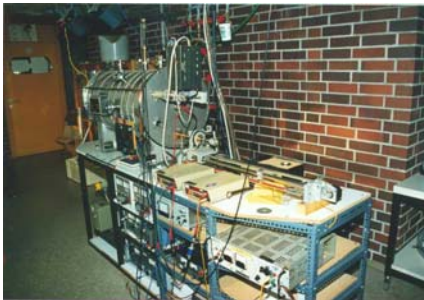


Fire ball



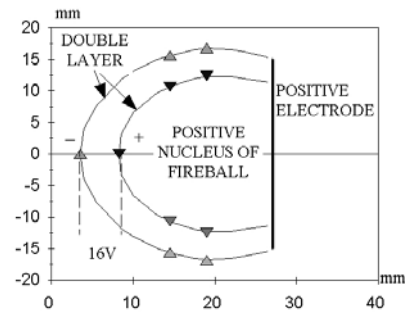
Dan Gheorghe Dimitriu, 2006

Experimental set- up



Innsbruck DP-machine

Fire balls - Complex space charge structure (CSCS)



Dan Gheorghe Dimitriu, 2006

Conclusion

All ball lightning characteristics (according to statistically analyzed ball lightning reports) were not yet observed in real experiments.

Further research is needed considering:

1. Properties of fireballs in different conditions (pressure, temperature, dimension of the machine, power of filaments) with different types of gases and vapours.
2. Other possible applications of fireballs.
3. Analysis of different plasma theories of the ball lightning.

References

- Mark Stenhoff, Ball Lightning- An Unsolved Problem in Atmospheric Physics, 1999, Plenum Publishers, New York
- Codrina Ionita, Dan- Georghe Dimitriu, Roman W. Schrittwieser, Elementary processes at the origin of the generation and dynamics of multiple double layers in DP machine plasma, International Journal of Mass Spectrometry, 2004
- S. Singer, Progress Toward a Solution of Ball Lightning, 9th International Symposium on Ball Lightning (ISBL- 06), 16 – 19 August 2006, Eindhoven, The Netherlands Rds. G. C. Dijkhuis, D.K. Cellebaut and M. Lu
- C. Ionita, D. G. Dimitriu, R. Schrittwieser, Complex space charge structures in laboratory and natural plasmas, 7th international Balkan workshop on applied physics, Constanta, 5-7 July 2006
- C. Ionita, D. G. Dimitriu, R. Schrittwieser, Experimental results related to the generation and dynamics of complex space charge structures in low-temperature plasma, Madrid 2006.