discharge, the effect was named by Mediterranean sailors who regarded it as a good omen from their patron saint, Elmo, because it tended to appear on the yardarms and mast tips during the latter stages of a violent thunderstorm, signaling the end to stormy seas. Despite its nonconsuming nature, its eerie glow emanating from pointy objects such as church steeples and metal weather vanes has led more than one observer to mistakenly cry, *"Fire!"* Aircraft flying through thunderstorms and hurricanes often develop the discharges from the propeller, antennas, wings, and sometimes the entire fuselage.

RED SPRITES, BLUE JETS, ELVES, AND TROLLS

In the upper reaches of a large thunderstorm thrives a newly discovered race of faint optical marvels called Transient Luminous Events (TLEs). This race's vividly named constituents conjure up some lively and magical fairy-world imagery which, due to their whimsical, fleeting natures—and until we know more about their physical properties—actually seems somehow appropriate. Red sprites, blue jets, ELVES, and trolls are upper-atmospheric discharges that have only recently been documented using low-light-level television technology, and may prove to be quite common. Further research hopes to more accurately define the role of TLEs in the global electrical circuit and their possible contributions to the formation of the Earth's protective ozone layer.

Red sprites are large flashes that appear directly over an active but decaying thunderstorm at the exact moment as positive cloud-to-ground lightning strokes appear. Lasting no more than three to ten milliseconds, they flash in groups from above the cloud tops to almost sixty miles high, as brightly glowing clusters of crimson columns or rocketlike plumes. Trailing downward from their highest parts are often bluish filamentary tendrils, resembling those of a jellyfish, which may drop as low as twenty miles.

Blue jets are ejected in narrow cones from the top of the most electrically active core of the thunderstorm and reach heights of twenty-five to thirty miles before vanishing after a relatively long lifespan of a few tenths of a second. Blue starters are brighter but shorter jets that over regions where large hailstones fall.

ELVES are huge, disk-shaped regions of luminosity that expand up to 300 miles across and vanish in the span of less than one millisecond. They are thought to associate with cloud-to-ground lightning when a large electromagnetic pulse is released into the ionosphere. Discovered in 1992 with a low-light video camera aboard the space shuttle, ELVES get their name from the acronym for **E**mission of **L**ight and **V**ery low frequency perturbations due to **E**lectromagnetic pulse **S**ources.

Sprite halos are glows shaped like ELVES that precede red sprites and flash downward for a millisecond.

Trolls resemble blue jets but are red and seem to shoot off after the tendrils of especially vigorous red sprites reach downward toward the cloud tops.

Superbolts or gigantic jets shoot upward from cloud tops nearly sixty miles into the upper atmosphere and spread out to form shapes resembling giant trees or carrots.

LOCATING LIGHTNING AND TRANSIENT LUMINOUS EVENTS Lightning is found wherever thunderstorms roam. In a thunderstorm, lightning may originate from any part of the cloud. The most common flashes are contained entirely within the cloud and comprise up to 80 percent of the strikes. Negative lightning issues from the lower portion of the most electrically active core. Positive lightning, which originates in the upper part of the cloud, tends to be the most dangerous as its strokes generally are the largest and longest, and carry the greatest charge.

Red sprites, blue jets, and ELVES are distinctively shaped upper-atmospheric discharges from thunderstorms that have only recently been documented using low-light-level video technology. Along with several other electrically generated optical phenomena, they are collectively known as Transient Luminous Events (TLEs) and are the subjects of ongoing research.

OBSERVING SPRITES AND JETS The Geophysical Institute of the University of Alaska, Fairbanks, which conducts research on TLEs, offers the following pointers for observing sprites and jets:

1. A clear view above a thunderstorm is required. This generally means the thunderstorm activity must be on the horizon. Additionally, it must be completely dark (no longer twilight) and there must be little intervening cloud cover.

2. The best viewing distance from the storm is 100 to 200 miles. At these distances sprites will subtend a vertical angular distance of 10° to 20°.

3. Your eyes must be completely dark-adapted. If you can see the Milky Way, then it is probably dark enough and your eyes have adapted enough to see sprites.

4. Fix your gaze on the space above an active thunderstorm. Do not be distracted by underlying lightning activity in the storm. Block out the lightning and the cloud itself with a piece of dark paper.

5. Sprites are very brief flashes just on the edge of perceptibility. They occur too quickly to follow with your eyes, but their strange vertically striated structures and dull-red color may be perceived.

6. Patience is rewarded. If the right kind of storm is present and your viewing angle is favorable, then there is a greater likelihood of seeing a sprite than of seeing a comet or shooting star.