FIRE IN THE SKY*

BY GREG BEAUMONT

Pretty soon it darkened up, and begun to thunder and lighten; so the birds was right about it. Directly it begun to rain, and it rained like all fury, too, and I never see the wind blow so. It was one of these regular summer storms. It would get so dark that it looked all blue-black outside, and lovely; and the rain would thrash along by so thick that the trees off a little ways looked dim and spiderwebby; and here would come a blast of wind that would bend the trees down and turn up the pale underside of the leaves; and then a perfect ripper of a gust would follow along and set the branches to tossing their arms as if they was just wild; and next, when it was just about the bluest and blackest -fst! it was bright as glory and you'd have a little glimpse of treetops a-plunging about away off yonder in the storm, hundreds of yards further than you could see before; dark as sin again in a second, and now you'd hear the thunder let go with an awful crash, and then go rumbling, grumbling, tumbling, down the sky towards the under side of the world, like rolling empty barrels down-stairs — where it's long stairs and they bounce a good deal, you know. **The Adventures of Huckleberry Finn,** Mark Twain.

OF ALL THE natural spectacles which awed and threatened early man, perhaps none was as frequent and bewildering as the sudden violence of a thunderstorm. Thus in the shadow of towering cumulus did deities come to be born, and in thunderbolts were the judgments of divine wrath delivered.

Even scientific man, who knows better, may find a thin trace of that old fear reflected in some dark corner of his mind when lightning splits the night and clouds begin to speak. Yet, he understands such phenomena as the inevitable conclusion of a predictable chain of events; he knows that one of the ironies of a stable, natural order is that it demands a frequent, often violent, reckoning of its forces.

Developing thunderheads vary greatly in appearance. In the semi-arid climate of Nebraska, the billowing up of a huge cumulus cloud can often be observed against a clear blue sky. A large system may boil upwards to 50,000 feet where the upper reaches of the cloud encounter strong winds that carry it away, producing a flattened "anvil" top.

Referred to as "weather factories" because of the wide range and often severe conditions associated with their development, thunderstorms are produced by localized, unstable air masses. Thunderheads begin as cumulus clouds; these clouds signifying a convective overturning in the atmosphere, that is, an air cell which is rising because it is warmer and therefore more buoyant than the air around it. The summer sun beating down on an open field will produce a column of superheated air. If this cell of heated air is large, and if in rising it passes through a deep layer of moist air, conditions will be favorable for this convective overturning to develop into a storm cell.

The average thunderstorm consists of several of these convective cells. Each undergoes a definite life cycle. In the initial stage, strong updrafts move upwards through the cloud. After several minutes of this updraft, in which the rising air is rapidly cooled, precipitation is triggered, creating a downward movement of air.

When both upward and downward air movements are active, the cell has

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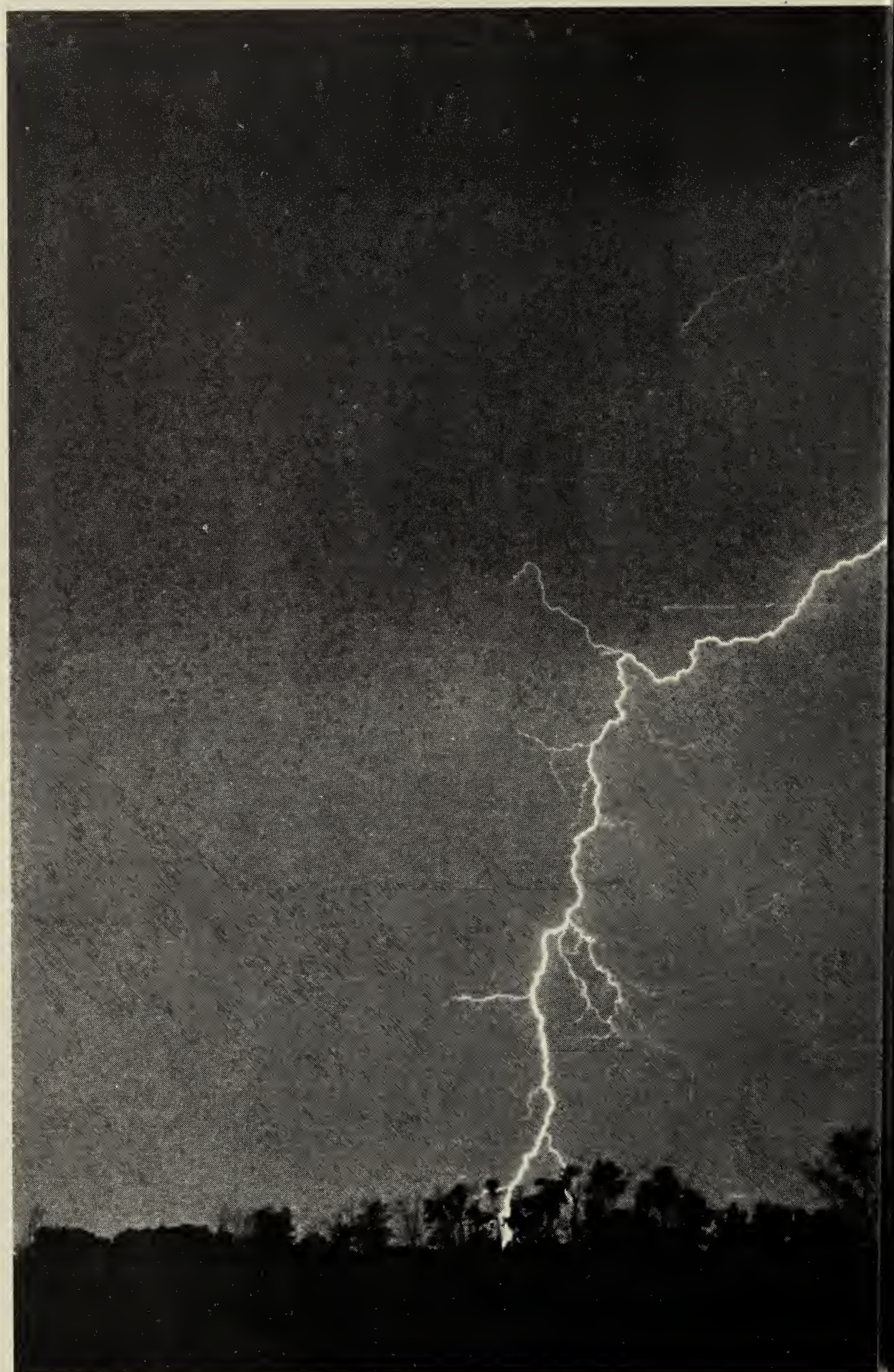

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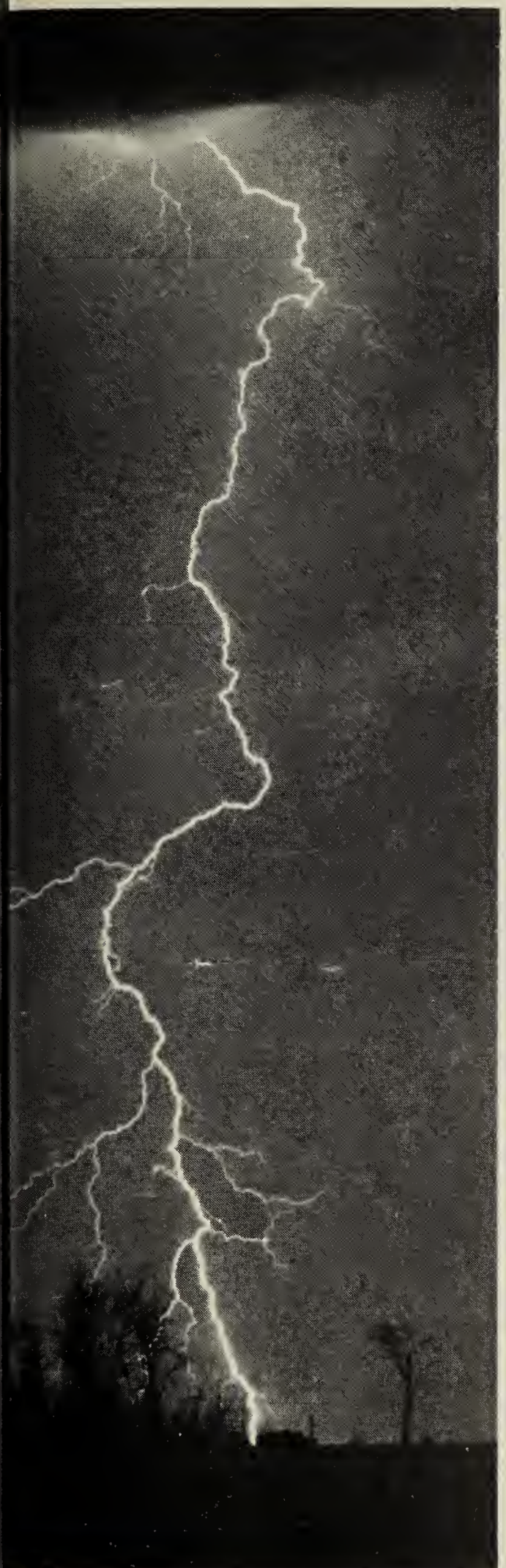

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passed into its mature stage. At this point the cell is highly unstable and produces violent winds, rain and electrical dischanges.

The downdraft, at first small and located to one side of the updraft, gradually enlarges and moves across the cell, shutting off the updraft. Now the storm cell rapidly weakens and enters its final stage of dissipation. The rain may end abruptly or continue for hours as light showers, depending on conditions of the air masses in which the cell formed.

Each of the three to five cells within the average thunderstorm has a life of about 45 minutes. Since each cell develops independently of the others, there is seldom more than one cell at violent maturity at any one time. When you observe the lessening of lightning activity in one area and an increase elsewhere, you are watching the dissipation of one cell and the maturation of another.

The most spectacular product of the thunderstorm is, of course, lightning. While the causes of lightning are complex, the actual bolt is nothing more than a natural process of equalization between unbalanced electrical charges. The turbulence of a thunderstorm displaces electrons from air molecules, resulting in a deficit or surplus, thus creating concentrations of negative or positive charge. Lightning is the adjustive mechanism whereby the natural electrical balance is restored.

Of the many identifiable forms of lightning, the ground discharge is the most fascinating, and most dangerous. The expression, "inviting disaster", is literally true for an exposed person during thunderstorm conditions. Since negative and positive charges are mutually attracted, an electrical leader will be "invited" upward from the ground when an oppositely charged leader leaves the cloud.

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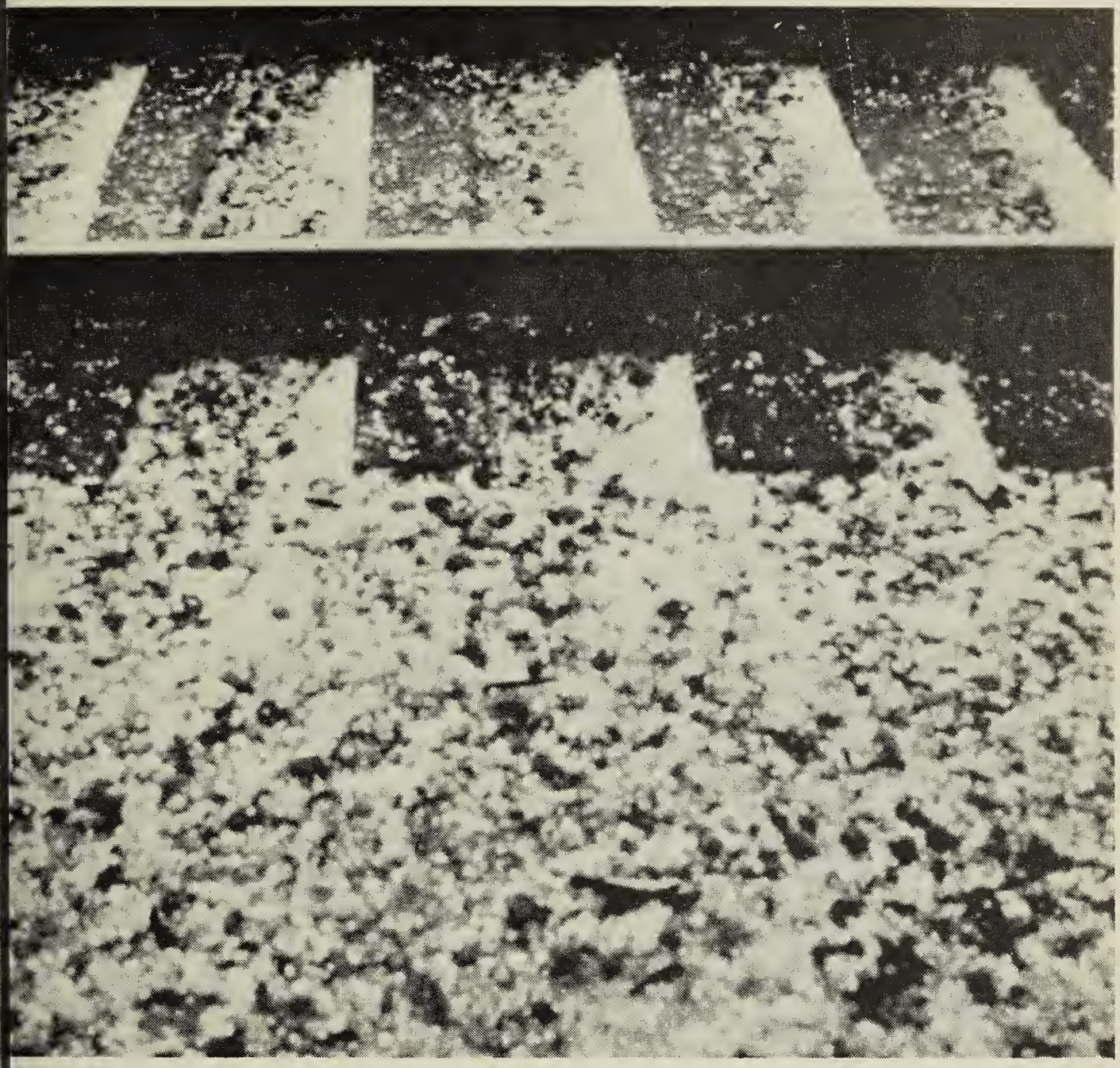
Naturally, this leader will travel upward through the path of least resistance. In open terrain, if there is not a windmill, high hill, tree or any other convenient conductor, a cow or person will suffice.

In open country, the union of these two leaders occurs several feet from the ground. Most ground discharges carry negative electricity from the cloud to earth. Once joined, these relatively weak leaders convey a massive surge of current. Termed a return stroke, this 30,000-amp bolt causes intense heat (over 53,000°F.) and luminosity.

The flash rate of a cell begins at one or two discharges per minute, increases rapidly to an average of five per minute, and is quickly exhausted. Should the storm develop at high altitude, most electrical exchanges will be from cloud to cloud.

Thunder is produced after the electrical channel displaces air, creating a compression wave. The characteristic rumbling of a distant storm is caused by sound waves



Rails, ties and hail

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reaching an observer from different origin points. Since a bolt may be miles in length, and since sound waves are emitted at every stage of the bolt's development, they do not reach the observer at any one time or from a single source. The commonly observed "heat" lightning of a summer evening is simply a thunderstorm in progress at a distance too great for thunder to be heard.

While thunderstorms occur everywhere on earth, they develop most readily along the equator, becoming infrequent beyond the 50° North and South latitudes. In polar regions, conditions are seldom present for thunderstorms propagation.

It has been estimated that at any one moment there are about 1,800 thunderstorms in progress around the earth. Since a mature cell will generate approximately five flashes a minute, we can estimate 150 flashes occuring every second.

As a violent and dramatic natural force, a thunderstorm, like a volcano or an earthquake, can be seen as necessary chaos to maintain established order — a ritual of instability to insure the long-term equilibrium of this changing, yet changeless, planet.