Another and much less reasonable class of explanations depends upon magneto-electricity. Some of these introduce the so-called “ unipolar ” induction supposed to be due to the rotation of the earth, which behaves like a gigantic magnet. Of this nature is the suggestion of Edlund, which was recently crowned by the Academy of Sciences of Paris. That rapid variations in the earth’s magnetic elements, such as often occur on a large scale, as in a “ magnetic storm,” have at least a share in the production of the aurora is a perfectly reasonable and even plausible hypothesis, long ago brought forward by Balfour Stewart. But we have yet to seek the source of these variations.

The brightness of a flash of lightning is usually much underrated. It is true that it rarely gives even at night an illumination greater than that due to moonlight. But it must be remembered that Swan has proved that the impression of a flash on the eye depends upon the duration, being nearly proportional to it, and steadily increasing for about a tenth of a second. Now the duration of a light­ning-flash is (roughly speaking) only about one millionth of a second. This is proved by the fact that the most rapidly rotating bodies appear to be absolutely steady when illu­minated by it. Hence, if it could be made to last for a tenth of a second, it would give near objects an illumina­tion one hundred thousand times more brilliant than that of moonlight. It must be remembered that the flash is not a mere line, but a column, of intensely heated air, driven outwards from the track of the discharge at a rate initially far greater than that of sound.

What is called “ summer lightning ” or “ wild-fire ” is sometimes a rather puzzling phenomenon. In the majority of cases it is merely the effect of a distant thunderstorm. It is also often due to a thunderstorm in the higher strata of the atmosphere overhead,—the reason why we hear no thunder being not so much the distance from the spectator as the fact that sounds generated in rarer air lose rapidly in intensity as they are propagated into denser air. But, besides these more common forms of the phenomenon, there is certainly a form of sheet lightning which occurs, without either sound or cloud, often close to the spectator. The cause of this is not at all obvious.

But the most mysterious phenomenon is what goes by the name of “ globe lightning ” or “ fire-ball,” a pheno­menon lasting sometimes for several seconds, and therefore of a totally different character from that of any other form of lightning. The fire-ball is almost incomparably less brilliant than forked lightning, because, though it lasts long enough to give the full impression of its brightness, it is rarely brighter than iron in the state which we call “ red-hot.” It is always spherical, often more than a foot in diameter, and appears to fall from a thunder cloud by its own gravity, sometimes rebounding after striking the ground. It usually bursts with a bright flash and a loud explosion, occasionally discharging flashes of lightning. No experimenter has yet succeeded in producing artificially anything resembling these natural and intensely charged Leyden jars.

The term “ thunderbolt,” which is nowadays rarely used except by poets (and by the penny-a-liners), preserves the old notion that something solid and intensely hot passed along the track of a lightning flash and buried itself in the ground. Two distinct classes of phenomena probably gave rise to this notion. When lightning strikes the ground it often bores a hole of considerable depth, which is found to be lined in its interior with vitrified sand. This presents no difficulty. But Aerolites (*q.v.)* are often found, in the holes which they have made, still intensely hot, in conse­quence of their rapid passage through the air. A hasty generalization seems to have connected these two entirely independent phenomena, and thus given rise to the notion of the thunderbolt. The ancient notion that a lightning flash could occur in a clear sky is probably to be accounted for by the occasional appearance of these ultramundane visitors.

The sulphurous smell of lightning, which is vividly de­scribed in the *Odyssey,* is now known to be due to the formation of Ozone (q.v.).

For the precautions necessary to prevent danger from a thunderstorm, see Lightning Conductor.

A whole volume of Arago’s collected works is devoted to thunder­storms, and many important observations are to be found in the writ­ings of Μ. D’Abbadie and other scientific travellers. (P. G. T.)

THÚN-KHWA, or Thonegwa, a district in the Pegu division of Burmah, lying between 17° 37' and 19° 28' N. lat., and between 95° 53' and 96° 53' E. long., with an area of 5413 square miles. It is bounded on the N. by Henzada, E. by Rangoon, S. by the Bay of Bengal, and W. by Bassein district. The whole district is a large deltaic plain, divided by the numerous channels of the Irrawaddy into saucer-shaped islands, with deep depressions in the centre. The Irrawaddy traverses Thún-khwa from north to south, throwing off numerous branches until it falls into the Bay of Bengal. Geologically, Thún-kbwa is composed of “ older alluvial clay,” differing from that of the Gangetic basin in being less rich in lime.

The population of Thùn-khwa in 1881 was returned at 284,063 (males 150,131, females 133,932); Hindus numbered 723, Moham­medans 1650, Christians 6894, and Buddhists 274,237. The largest towns in the district are Yandoon and Pantanaw, with populations (1881) of 12,673 and 6174 respectively. The land is much less fertile than that of the neighbouring districts. In 1885-86 the area under cultivation was 349,259 acres, and the cultivable area 1,262,374 acres. The principal crops are rice, fruits, vegetables, and sugar-cane. The total revenue realized in the year 1885-86 amounted to £194,737, of which the land contributed £66,590. Thún-khwa was constituted a district in 1875, and its history previous to that date is identical with that of Henzada, to which adminis­trative division it originally belonged. During the first Burmese war no resistance was offered to the British in the district as it at present exists except at the town of Donabyu. At the time of the second war Donabyu was undefended, but, after the occupation of Prome, Myat Htún, an ex-thúgyi of a small circle, succeeded in collecting a body of men and defied the British. Early in January 1853 the enemy were driven out of Donabyu, but on penetrating into the interior the British were forced to retire. In a subsequent engagement the British were driven back; but the enemy were eventually dispersed and their works captured.

THURGAU, or Thurgovia, a canton of Switzerland (ranking as seventeenth in the Confederation), takes its name from the river Thur. It is bounded on the N. by the Rhine, on the E. by the Lake of Constance (the can­tonal frontier being so drawn as to leave the town of Con­stance to Baden), on the S. by a line running from Arbon on the lake west and south-west to Hörnli, and on the W. by a line drawn from Hörnli passing east of Winterthur and west of Frauenfeld to the Rhine, a little west of Diessen- hofen and opposite Schaffhausen. It is thus shaped like a triangle, of which the Hörnli (3274 feet, the highest point in the canton) is the apex, and comprises the middle basin of the Thur. Its total area is 381⋅4 square miles, of which 322⋅6 (or 84⋅6 per cent.) is reckoned as “productive land,” 69⋅8 being covered by forests, and 6⋅9 by vineyards. Of the “ unproductive ” portion no less than 50⋅5 square miles consists of the cantonal share of the Lake of Con­stance. According to the census of 1880, the population amounted to 99,552 (females being in a majority of 1000), an increase of 6252 on the census of 1870; of these, 99,026 are German-speaking. In religion the inhabitants are divided, there being 71,821 Protestants to 27,123 Roman Catholics; the canton till 1815 was in the diocese of Constance, and since 1828 has been in the reconstructed diocese of Basel, though for some time after 1873 the Government would not recognize the authority of Bishop Lachat, in consequence of his support of the dogma of