THE GREAT MADRID METEOR.

ON Monday, February 10, at 9h. 29m. 30s., there was observed an instantaneous bluish-white illumination in the atmosphere, so strong and vivid as to be visible in the inner rooms and in the open air.

The day was a magnificent one: blue sky, no wind, and a radiant sun.

Soon after there was plainly visible near the zenith, and some few degrees to the south-east, a white spot, like smoke, bearing north-east to south-west, of about 6° length and 1° wide; its form was semicircular, with the convexity turned to the east. In the centre, and near the apex of the curve, it presented a condensation of a reddish colour, similar to those of clouds at sunset. The general appearance of the spot was that of a light cirro-cumulus.

At 9h. 30m. 40s. there was heard a deep and very strong detonation, accompanied by many others not so intense, similar to the noise produced by a large cannon-ball running along the upper storey of a house. This noise was very prolonged; it was found to last two minutes.

Meanwhile the vibration of windows and partitions (not the thick walls) was extraordinary, and the rattling of panes of glass alarming. In some houses all the window-glasses were broken.

Judging from the time which elapsed between the light and the sound of the first detonation, the meteor exploded in the air at a distance not inferior to 24 kilometres; and this number is evidently too low.

Considering the aspect of the spot of smoke, it seems probable that the meteor proceeded from the south-east towards the north-west, and that near the zenith of Madrid it exploded.

Changed into smoke and dust, totally or partially, this smoke was carried away by the superior currents of the atmosphere to the east. We find here a splendid confirmation of the theory which supposes that, at the upper limits of the air, the wind moves from west to east.

In the accompanying rough sketch, one part corresponds to the trajectory of the celestial body; and the other, which forms an angle with the first, to the action of the aerial current.

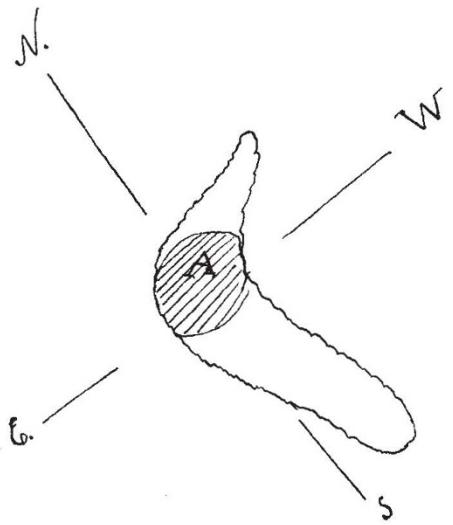

FIG. 1.—Aspect and position of the cloud some minutes after the explosion. A, Condensation of a reddish colour.

The accompanying photograph of the phenomenon was taken by an amateur some few minutes after the explosion.

The cloud continued its course to the E.N.E., or E. ¼ N.E., dissolving gradually away, and at 3h. p.m. it was still perfectly visible like a light cirrus in the east at some 20° above the horizon.

The compression of the atmosphere in the instant of the conflagration was indicated by the registering barometers. In the aneroids the trace is small; but in the mercurial one the column rose 1·6 m.m., and lowered 0·7 m.m., the amplitude of the total oscillation being 2·3 m.m.

In the neighbourhood of Madrid some fragments of the meteor fell, and I have obtained one of them.

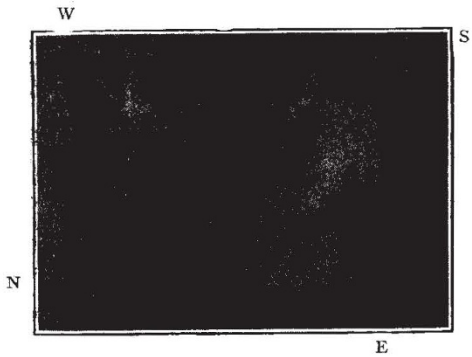

FIG. 2.—Photograph of the cloud immediately after the explosion.

Externally the fragment is of a black metallic aspect; inside it is of white stony appearance, with some brilliant points like nickel; it weighs 6·3 grams.

From information received later, it appears that the phenomenon was visible in a large part of the Peninsula, from Sierra de Estrella (Portugal) to Denia in the Mediterranean coast, and from Segovia to Aguilas, or a distance of 700 kilometres from east to west, and 400 from north to south. These are inferior limits.

AUGUSTO ARCIMIS.

THE FRILLED LIZARD: "CHLAMYDOSAURUS KINGI."

THE above-named lizard inhabits the northern or tropical territories of the Australian continent, and is tolerably abundant in both North Queensland and the Kimberley district of Western Australia. Its earliest record is that given by Captain Philip P. King, in his "Narrative of a Survey of the Intertropical Coasts of Australia" (1826), and wherein it is named, figured, and described in a Natural History Appendix by Dr. J. E. Grey.

The habitat of the frilled lizard is essentially sylvan, its resort being the thickly-wooded scrublands, and its favourite abiding-place the trunks and lower limbs of the larger trees. The length of the finest examples rarely exceeds three feet, and of this the long, rough, though slender tail monopolises the greater moiety. Living specimens exhibit a considerable individual colour variation. The predominant hue of the body is pale brown with reticulated markings; while the frill, in the males more especially, is usually decorated with interblending tints of yellow, scarlet, and steel-blue.

No living example of this singular lizard had, up to the present year, been brought alive to Europe, a circumstance which will account, to a large measure, for the fact of certain abnormal phenomena connected with its life-habits having hitherto attracted little or no scientific attention. Through the possession of living specimens of *Chlamydosaurus* in both Queensland and Western Australia, several interesting data concerning the species have fallen within my notice. Having, furthermore, succeeded in bringing one out of several examples embarked safely to England, my presentation of the animal to the

Zoological Society's Gardens, where it was on view for some weeks, has afforded many fellow-naturalists the opportunity of verifying the phenomena here recorded.

The most conspicuous structural feature of *Chlamydosaurus kingi* is the extraordinary development of the cuticle of the neck, that gives to it its popular title. This takes the form of a voluminous frill or collar, which, while the animal is at rest or undisturbed, is neatly folded in symmetrical pleats around the creature's neck and shoulders. No sooner, however, is the lizard excited to hostility by the approach of a threatening assailant, than, coincident with the opening of the mouth, the frill is suddenly erected, much after the manner of the unfurling of an umbrella, and stands out at right angles to the longer axis of the body, measuring under such conditions some seven or eight inches in diameter.

The mechanism by which the erection and depression of the frill of *Chlamydosaurus* is accomplished is intimately connected with a slender process of the hyoid bone, which traverses the substance of the frill on each side, and is so adjusted that the opening of the creature's mouth and the erection of the frill are synchronous operations. A characteristic photograph from life of this lizard in a condition of excitement, and standing at bay, with mouth open and frill erect, is afforded by Fig. 1, representing one of many I was fortunate in securing from the specimen I brought to England.

The function of the frill in *Chlamydosaurus* is, as apparently indicated by the circumstances and conditions under which alone it is displayed to view, purely that of a "scare-organ," wherewith by its sudden expansion many of its would-be assailants are frightened and deterred from attacking it. Instances have, in fact, been recorded to me of dogs, which will readily rush upon and kill other and larger lizards, such as *Varani*, refusing to come to close quarters with so formidable-looking an object as *Chlamydosaurus*, when it turns upon them with gaping mouth and suddenly erected frill.

Chlamydosaurus displays, however, additional defensive tactics. When approached these lizards will often spring aggressively at the intruder, and in addition to using their not very formidable teeth, will lash sideways with their long rough tails with such vigour as to smartly sting the hand which may fall within range of the unexpected impact.

The natural food of the frilled lizard consists almost exclusively of Coleoptera and other bark-frequenting insects; a fact which emphasises the difficulty of keeping them long in a state of captivity. The several specimens in my possession became fairly accustomed to dieting on raw meat, though they would not take to this artificially substituted pabulum voluntarily. On the slightest excitement, however, they would open their mouths and erect their frills, and on which occasions it was a simple matter to administer pieces of meat, which were then readily assimilated.

The most remarkable feature placed *en evidence* by the specimens I kept in captivity, was their peculiar method of perambulation. The statement that the frilled lizard was in the habit of running erect on its hind legs only, was made to me in Queensland some years ago. I failed, however, to verify this assertion through the single living specimen I there had in captivity for a short interval; and neither was a friend in the northern district of the colony more fortunate, who, at my request, made experiments with several specimens. I was, on these grounds, inclined to suspect that the rumour, that had previously reached me, was the outcome of an optical illusion; many lizards, such as *Grammitophoræ*, running so erect on their haunches that it might be imagined their fore-limbs were raised from the ground.[1]

It was consequently to my no small gratification and delight, on becoming the owner of several specimens, including the one brought to England, obtained for me with the assistance of the aborigines of Roebuck Bay, Western Australia, that I found myself in a position to fully establish the truth of the report concerning the erect gait of *Chlamydosaurus* that had been communicated to me in Queensland. Possibly the specimens previously experimented with had been slightly injured during capture, and lacked the stamina to walk upright. At all events the Roebuck Bay examples, brought in straight from the bush, were in vigorous health, and at the first trial when left at liberty, save for a light retaining cord, ran along the ground almost perfectly erect, with both

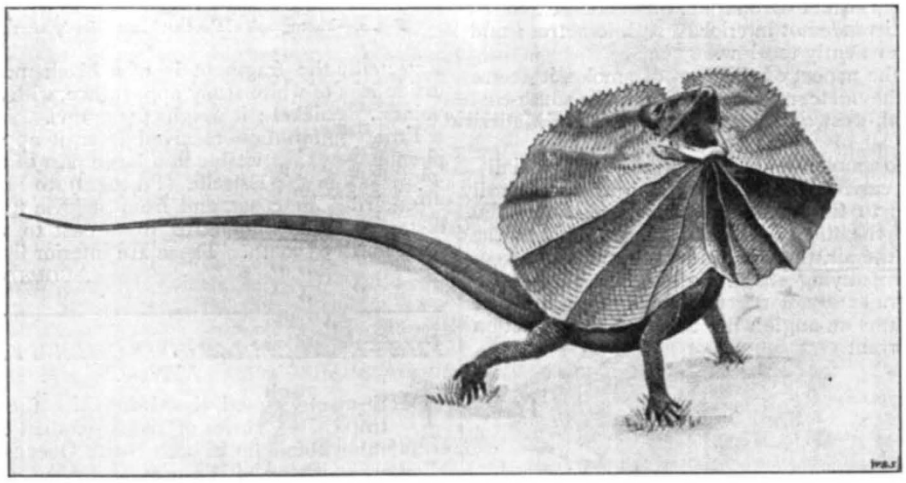

FIG. 1.—*Chlamydosaurus Kingi*, standing at bay with erected frill. (Reproduced from an instantaneous photograph by W. Saville-Kent.)

[1] It has quite recently come to my knowledge that a report of the bipedal comportment of *Chlamydosaurus* was communicated some years since to Dr. Henry Woodward, F.R.S., who referred to the circumstance in a paper on "Forms Intermediate between Birds and Reptiles" in the *Quart. Journ. Geological Society*, vol. xxx. 1874. The concluding paragraph of that paper, wherein Dr. Woodward favours the interpretation that "the bipedal habit of the secondary reptiles is a peculiarity still maintained by the Australian *Chlamydosaurus*," is of special interest with relation to the latter portion of this article. The assertion made by Dr. Woodward's informant in the journal quoted, that *Chlamydosaurus* is common near Sydney, is a mistake due, probably, to the circumstance that another lizard, *Amphibolurus barbatus*, having a less developed neck-membrane, inhabits that district, and is sometimes also known locally as the Frilled Lizard. The structure of this type, however, would not permit of its bipedal progression.

their fore-limbs and long tails elevated clear of the ground.

The attempt was made on the spot to permanently register, with the aid of the Kodak camera, the absurdly grotesque appearances these lizards presented when progressing in this bipedal fashion. Such, however, was the speed at which the animals ran, that the shutter of that instrument did not work fast enough to secure anything better than a blur at close quarters, and it was only by bringing an Anschutz camera with its most rapid roller-blind shutter to bear on the specimen, after its arrival in London, that the Figs. 2 and 3, here reproduced, were secured. While even these partake much of the nature of silhouettes, they will serve to indicate the more characteristic running attitudes which this lizard may assume.

Fig. 2 in this series carries with it so essentially human an aspect that one is sorely tempted, at the risk even of incurring scientific contumely, to place a cricket-bat in its right hand. The distance *Chlamydosaurus* will traverse in this remarkable erect position may average as much

FIG. 2.—*Chlamydosaurus* running erect. Posterior view, taken with Anschutz hand camera.

as thirty or forty feet at a stretch, and when, after resting momentarily on its haunches, it will resume its running course. When, however, a short space of a few yards only have to be covered, the animal runs on all-fours, sitting somewhat high on its haunches after the manner of many ordinary lizards, such as the *Grammitophoræ*, previously referred to.

The profile outline of *Chlamydosaurus*, presented by Fig. 3, is peculiarly interesting, since it possesses so much in common with that of a running long-tailed bird, such as a pheasant. This bird-like aspect of the frilled lizard, as exhibited when it crosses the observer's path in bipedal fashion, has been the recent subject of remark to me by a friend familiar with the species in the Kimberley district of Western Australia.

Special interest is attachable to this avian-like ambulatory deportment of *Chlamydosaurus* by reason of the generally accepted interpretation that the birds are modified descendants of a reptilian archetype. The temptation is naturally also very great to institute comparisons between, and to suggest possible affinities with, this peculiar lizard and the extinct group of the Dinosauria, and among whose representatives a bipedal locol motive formula was apparently a characteristic feature. A reference, however, to the skeleton of *Chlamydosaurus* does not encourage any sanguine anticipations that may have been previously entertained in this direction. It yields no indication of that peculiar avian modification of the pelvic elements, adapted for bipedal locomotion, that are so essentially diagnostic of the more typical Dinosauria, while in all general points it is indistinguishable from that of the ordinary Agamidæ.

Though, as a consequence, no serious attempt would be justified to correlate the erectly progressional *Chlamydosaurus* with such ponderous specialised Dinosaurs as, say, *Iguanodon* or *Brontosaurus*, there are some few species at the lacertilian end of the chain, that probably presented when living, a by no means remote likeness to this existing type in both aspect and gait. The *Compsognathus longipes* of A. Wagner, from the lithographic stones of Solenhofen, is more especially worthy of mention in this connection. In size, some three feet long only, and in the proportions of the limbs and other points, it must have been almost a counterpart of *Chlamydosaurus kingi*. It is particularly noteworthy of it, moreover, that, as pointed out by the late Prof. Huxley

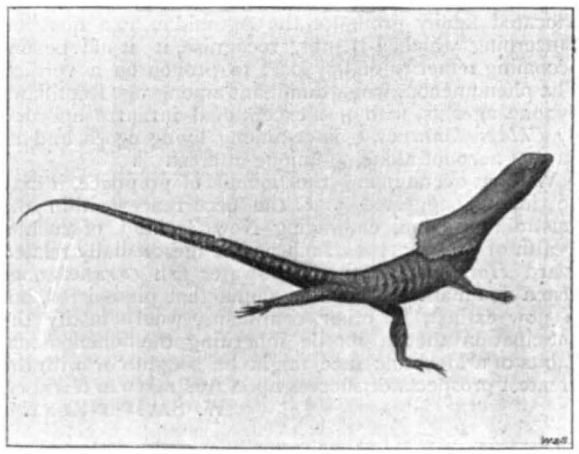

FIG. 3.—*Chlamydosaurus* running erect. Profile view.

("Anatomy of Vertebrata," p. 262, ed. 1871), the pelvic elements of *Compsognathus* correspond more essentially with those of the ordinary lizards than with those of the aviform Dinosauria, the pubes in particular being apparently directed forwards and downwards, like those of lizards. This type, as likewise *Stenopelyx*, is also referred to by the same authority (p. 263) as indicating that the more typical modification of the pelvis, and in which the pubes are directed backwards parallel with the ischia, as in birds and Iguanodon, "was by no means universal" among the Dinosauria or Ornithoscelida, as Prof. Huxley preferentially named them.

Notwithstanding the distinctly recognised lacertilian character of the pelvis of *Compsognathus*, Prof. Huxley had no hesitation in assigning to this type an erect bipedal method of locomotion. Writing of it in the *Popular Science Review*, 1866, that illustrious biologist remarks: "It is impossible to look at the conformation of this strange reptile, and to doubt that it hopped or walked in an erect or semi-erect position after the manner of a bird, to which its long neck, slight head, and small anterior limbs must have given it an extraordinary resemblance."

The silhouette presentment of *Chlamydosaurus* afforded by Fig. 3, forms a not inapt embodiment of the flesh-clad

skeleton that must have suggested itself, ghost-like, to the learned Professor's mind. And it is among my keen personal regrets for the loss the world has sustained through the decease of Prof. Huxley, that I should have been deprived by so short an interval of gladdening my former teacher's eyes with the sight of a living organism which, if only in the direction of superficial analogy, so nearly realised one, among the many, of his most sagacious interpretations of the fossil past. One remaining point in the erect running gait of *Chlamydosaurus* invites brief attention. Such is the conformation of the hind foot and its component digits, that when thus running the three central digits only rest upon the ground. As a consequence of this structural peculiarity, the tract made by this lizard when passing erect over damp sand or other impressible soil, would be tridactyle like that of a bird, and would also correspond with such as are left in Mesozoic strata by various typical Dinosauria. This tridigitigrade formula of the gradation of *Chlamydosaurus*, induced by the great relative shortness of the first and fifth digits, is distinctly indicated in the second of the accompanying figures.

Whether or not the bipedal locomotive comportment of *Chlamydosaurus* has been transmitted by heredity from a lizard-like Dinosaurian such as *Compsognathus*, or has been re-developed independently among its allocated family group of the Agamidæ, is a question concerning which, I humbly recognise, it would be unbecoming temerity on my part to pronounce a verdict. The phenomenon, while dominant among the Reptilia of bygone ages, is, with the exceptional instance afforded by *Chlamydosaurus*, extinct among living types, and is, on that account alone, of unique interest.

Without overstepping the bounds of prudence, it may be finally suggested that the occurrence within the Australian region, embracing New Zealand, of such a wealth of archaic types such as the mesozoically related lizard *Hatteria* and the fresh-water fish *Ceratodus*, as also a dominant mammalian fauna that pre-existed, but is now extinct, in other continents, would justify the anticipation that a reptile inheriting the phenomenal habits of a Mesozoic race might be sought for with the greatest prospects of success upon Australasian territory.

W. SAVILLE-KENT.

NOTES.

THE list of Presidents for the ten Sections of the British Association, for the Liverpool meeting in September next, has been published. All the Sectional Presidents having accepted the nominations, the list may be regarded as definitive. President of the Association—Sir Joseph Lister, Bart., P.R.S. Section A—Mathematics and Physics, Prof. J. J. Thomson, F.R.S. Section B—Chemistry, Dr. Ludwig Mond, F.R.S. Section C—Geology, Mr. John Edward Marr, F.R.S. Section D—Zoology, Prof. E. B. Poulton, F.R.S. Section E—Geography, Major Leonard Darwin. Section F—Economics, Right Hon. Leonard Courtney, M.P. Section G—Mechanical Science, Sir Charles Douglas Fox. Section H—Anthropology, Mr. Arthur Evans (Keeper of the Ashmolean Museum, Oxford). Section I—Physiology and Pathology—Dr. Walter Holbrook Gaskell, F.R.S. Section K—Botany, Dr. D. H. Scott, F.R.S. Evening discourses will be given by Prof. Flinders Petrie and, probably, by Sir Andrew Noble. The lecture to working men will be given by Prof. Fleming, F.R.S.

THE Toronto Local Committee are assiduously engaged in preliminary work for the meeting of the British Association for the Advancement of Science in 1897. Meetings of the executive committee are held every fortnight. Besides the executive committee, a number of sub-committees are at work, including those on finance, conveyances, publication and printing, rooms for offices, meetings of the association and committees, hotel and lodgings, press, hospitality, reception, and for securing co-operation of other institutes, associations, and corporations, postal, telegraph and telephone facilities. The attention of the committee on conveyance has already been called to the desirability of securing from the Canadian Pacific Railroad transportation for such members of the Association as may desire to extend their travels to the Pacific coast, with special reference to the suggestion that a meeting of the American Association for the Advancement of Science may follow the Toronto meeting, if adequate facilities for transportation are assured. This suggestion is based upon the fact that the American Association have already once voted in favour of such a meeting if satisfactory rates could be obtained; and the hope is still entertained that delegates from both British and Australasian Associations might find San Francisco a convenient point at which to meet the American Association. Mr. Griffith, the general secretary of the British Association, is expected to be in Toronto about May 22, to make arrangements for the meeting, and set out the proper lines of work.

FROM McGill University, Montreal, comes the information that Röntgen's experiments were not only repeated there with considerable success immediately on the announcement of his results in America, but have been applied to two important medical cases within the first week of their demonstration. Before any full description of Röntgen's method had crossed the ocean, Prof. Cox was enabled by a lucky guess, and with the aid of the fine McDonald apparatus, to reach success at the first attempt. Four days later a photograph was obtained, clearly showing the bones of the leg from the knee downwards, with the image of a bullet (which had been there for seven weeks and was causing trouble) clearly defined between the two bones, and resting against the inner angle of the tibia. The same photograph showed a copper wire which had been bound round the leg as a fiducial mark from which to measure. The bullet was six centimetres below the wire. On the following day the bullet was reached at a depth of two inches, and was extracted successfully. The exposure required for this photograph was forty minutes. The Pulüj tube (Geissler Catalogue 3080) has been found by Prof. Cox to be superior to any others tried. Its fluorescing screen seems to protect the glass, and is far brighter than that of the other tubes. It gave continuous exposures of 65 minutes without injury, and has since been used to detect a fracture of the ulna, and to produce a photograph of the hand, with perfect definition.

OUR U.S. correspondent writes under date February 14:—"The new photography continues to be the absorbing topic in scientific circles, and innumerable experiments and results are reported. Dr. Henry W. Cattell, of the University of Pennsylvania, has taken pictures of anatomical preparations with such success, that he infers it will be easy to obtain pictures of acromegaly, osteitis deformans, rheumatoid arthritis, &c. Prof. W. F. Magie, of Princeton, has invented a new instrument for use in diagnosis. A sheet of black paper, coated on one side with barium platino-cyanide, is placed with the coated side inward across the end of a tube or box, into which the observer looks, and which is so fitted to the face, or so shielded by cloths, that the phosphorescent substance and the eyes are protected from all extraneous light. If the tube be then directed towards the excited Crookes' tube giving the Röntgen rays, the phosphorescent paper in the tube glows, and the shadows of objects interposed between it and the Crookes' tube appear upon it. The first successful experiments in Brooklyn are by Prof. William C. Peckham, at the Adelphi Institute, using more direct methods than have heretofore been used, with a current of $3\frac{1}{2}$ amperes and an electrical pressure of six volts. Dr. A. Mau succeeded in