

mass to be moved, the temperature would rise enormously beyond what it would ultimately be on the establishment of an equilibrium. Hence it is quite in accordance with what we ought to expect if, on a collision between two bodies, the temperature should rise in a few hours or days so greatly that the joint mass would shine as a bright star. But this state of things could not be permanent, as the gravity of the mass would be insufficient to counteract the expansive force created by the enormous accession of heat. The mass would therefore expand, the rate of expansion being slow at first, increasing to a maximum, and finally dying out. The body would then be enormously diffused, but at a moderate temperature. The greater the velocity of the impact the lower would be the final temperature. A velocity can be assigned at which the body would be dissipated in infinite space, and the temperature exactly zero; but this velocity could not be acquired by the mutual attraction of the colliding bodies. With any velocity which we can admit as probable the final state of the mass would be a globe vast in proportion to the sum of the original volumes of the colliding bodies, with a moderate temperature. Such a body would present the appearance of a planetary nebula.

Before this final stage was reached there would be fluctuations. The outward velocity communicated to the gaseous atoms would cause the first expansion to go beyond equilibrium; indeed, the outward velocity at the position of equilibrium would be a maximum. Hence the body would be overexpanded and overcooled. It would then condense again, with a rise in temperature again overcompensated. This might, indeed, be repeated many times, finally dying out. These pulsations appear to have been observed.

The consideration applied here to two colliding globes would equally apply to colliding flights of meteors, but the effects might not be so marked—the rise in temperature would be more gradual. They would also apply to the case of a sphere plunging into a vast hydrogen region, such as the spectroscope reveals to us.

ART. XXIV.—*Notes on a Meteoric Appearance.*

By MARTIN CHAPMAN.

[*Read before the Wellington Philosophical Society, 2nd August, 1905.*]

I THINK it as well to put on record a remarkable phenomenon which was observed by myself, with many others, on the evening of the 9th June. A party of us left Otaki by the evening

train leaving Otaki about 6.10 p.m. The western sky was clear generally, but with a bank of clouds extending from the mainland over Kapiti; wind S.W. and fresh. There was a young moon. I was sitting on the western side of the carriage, looking out at the window. I turned for an instant to speak to a companion, and, on returning my gaze to the sky, I saw the appearance about which I write.

It was a brilliant vertical streak in the north-western sky, having a slight feathery wisp at the top, the upper part having two slight bulbous expansions. Its lustre was apparently that of a white-hot wire. I uttered an exclamation which brought all the occupants of the carriage to the windows. We watched the appearance and saw it gradually change in shape. The branch or wisp at the top extended, as did every part, both longitudinally and in breadth. It was visible to us for about a quarter of an hour, and finally disappeared behind a cloud. It was even then quite white, whereas all the clouds were inky-black. It appeared to the last to shine with its own light. The passengers in the other carriages also saw it, and some, I was informed, became strangely excited, two ladies showing fear and symptoms of hysteria. Curiously, a similar report comes from Auckland: some people manifested alarm. By the great majority, however, of those who saw it it was regarded as an object of interest and beauty. Those in the carriage where I sat who had seen waterspouts (of which I was one) agreed that at one stage the streak resembled the slender streak of bright light which is often seen as a waterspout finally disappears; but this streak was (1) much too brilliant, (2) much too minute, (3) much too high for such an explanation. I tried to form an opinion of its altitude and azimuth, but from a train going some twenty miles an hour over a line with curves this is no easy matter, and no reliance can be placed on such a determination. It, however, helps to form an estimate of the accuracy of other determinations. I thought the azimuth would be between 305° and 320° . I guessed the altitude at about 16° , but I had no horizon in view.

The apparition was seen from other stations. At Hokitika it was seen "in the north-western sky." At Nelson it was seen by many persons. One observer, Miss Bertha Maguire, an artist, showed an intelligent and artistic appreciation of the phenomenon; she sketched the object as she saw it, and her sketches so accurately represent what I saw that it is hardly necessary that I should exercise my feeble sketching powers. The differences between Miss Maguire's sketches and what I saw are small, and consist of the following: I should represent the streak (1) as being more slender, (2) as having a little wisp at the top,

and two slight bulbous swellings near the top, the beginning, perhaps, of expansion. By Miss Maguire's kindness and courtesy I am able to show you the original sketches. It was seen from Otaki, Wanganui, Halcombe, New Plymouth, Waiuku, and Auckland. The times from all these places agree, and also the description, except that some of the details are wanting from New Plymouth, whence the sketch is of two balls of light with an intervening streak of light.

The following azimuths have been given: Hokitika, "in the north-western sky"; Nelson, two observers 292° , and a third observer 315° magnetic; at Wanganui an observation was taken at a very late stage of a wisp of the cloud, the bearing being 295° ; New Plymouth, 310° ; Waiuku, exactly above where the sun set ($299^\circ 16'$ true). From Auckland three bearings are given: one, 358° magnetic, is an obvious mistake, and probably a clerical error. The second is 243° , said to be by observation with a prismatic compass: this being magnetic would give 258° true. The difference between these two is over 100° , quite beyond personal error. The third Auckland bearing is inexact—"to the south of west." There is also an azimuth from Otaki—W.N.W., or $303^\circ 45'$. These discrepancies may partly disappear when we learn which observations are "true" and which "magnetic."

There is a like discrepancy in the observations for altitude. Even three observations from the same place are discordant. The altitudes given are from 10° to 40° . Of course the real altitude would not be the same for different places, but one would like agreement between different observations from the same place. The New Plymouth observer, Mr. Palmer, a surveyor, gives 35° . My guess was 16° . The Otaki observer puts it at 12° . The Otaki altitude ought to coincide with whatever is correct for Waikanae. Mr. Buckeridge, of Auckland, gives " 15° , taken with a Barker's altitude instrument." Two sheets of paper, which I will call "A" and "B," were sent me from Nelson, with the angles drawn as follows: Horizon to bottom of streak—A, $3^\circ 30'$; B, 6° : horizon to top of streak—A, 10° ; B, 17° . Another Nelson altitude is 30° . No hypothesis can be formed which will reconcile all these; we can only hope to eliminate the bad ones.

The total length of the original streak is reckoned as between 6° and 10° , expanding to 15° , or perhaps 20° —i.e., from top to bottom, not following windings. The total length of the ribband of cloud, following windings, might reach 35° , or perhaps more. The breadth at the beginning, as I saw it, was minute, and the light so strong that the apparent breadth may have been due to irradiation. The breadth at the end of a quarter of an

hour was nearly, if not quite, 2° . These quantities are eye estimates, corrected by comparison with others, and by using an instrument on an imaginary representation—not a satisfactory proceeding. The figure gives some idea of the magnitude of the object.

Several persons claimed to have seen the very beginning. One, at Auckland, says it shot up from the horizon at an angle of 70° or 80° to a height of 40° . I feel pretty sure the shooting-up is erroneous; also, from my station the streak appeared vertical. Another observer, Mr. A. Scott, Auckland, said it "darted out of a cloud like a ball of silver; after dropping a few yards it just for an instant threw off coloured lights, like a rocket, and then left a pillar of silver light as it dropped to the earth. The bright perpendicular column, which remained perpendicular for nearly a minute, made quite a weird impression, till it began to be blown about by the wind. The silvery light would remain for about ten minutes."

Miss Maguire, the artist, whose name I mentioned above, says her impression is that her eyes were directed to the exact spot of the sky at the moment the object appeared. I see no reason to doubt this. If a person's eyes are directed to a point in the sky, and an intense gleam of light appears in the neighbourhood, the eyes are instantly drawn to bear on the spot where the gleam appears. Miss Maguire says her first impression was a flash of "crinkly lightning." Another observer at Nelson says he saw a ball of light fall and burst.

Mr. F. G. Gibb, of Nelson, a person of scientific attainments, whose observations are entitled to great weight, wrote to a newspaper describing what he saw. He says, "The sky was clearly visible at the time, and the 'streak of lightning frozen' remained clearly visible for about half an hour, though an observer who was well situated declares that the luminous cloud into which the streak resolved was visible for two hours. I turned a 5 in. refracting telescope upon the streak within a minute or two after the fall of the meteor, and found that it consisted of long-drawn-out wisps of luminous cloud, which had, I am almost sure, a slight movement downward. The direction in which it appeared from the Town of Nelson was exactly north-west magnetic."

The description by Mr. Palmer, of New Plymouth, differs surprisingly from all others. He says he first observed a luminous head, and afterwards another ball of light also appeared lower down. This latter shape it kept for about ten minutes, and then finally dissolved. His sketch is of two balls, one above the other, not quite vertically, connected by a thread of light, which is prolonged beyond the lower one.

My own first view must have been some instants (hardly seconds) after the commencement. What I saw was a streak of intense white light, with two small bulbous expansions near the top, these expansions forming the brightest part; also a very small feathery expansion at the very top.

I am now trying to work out the distance, a simple enough problem given accurate observations; but, unfortunately, there are such discrepancies in the observations that the first business is to find out and eliminate the incorrect ones—no easy matter.

It is a source of great pleasure to me to have to record this interesting phenomenon, the more so because, so far, it would appear that the occurrence was absolutely unique. No such phenomenon has, to my knowledge, ever been recorded before. Great meteors have often been seen and recorded, and then partly calculated. I had the pleasure of seeing one of the greatest on record—one that gave more light than the full moon, which passed over an arc of 90° or more, and left a glowing train, 30° or 40° long. But that train was gone in a few minutes. Yet this object seen by us left a train which was still shining brightly at the end of fifteen minutes, and was seen for another fifteen, and perhaps even, as some say, for hours. I think I am justified in saying that those who saw it saw something the like of which has never been recorded.

Since writing the above I have made inquiries in the hope of reconciling the wide discordances of observation. I regret, however, to say my attempts have been vain. This being the case, it is useless to attempt to fix the exact position; however, by graphical methods, selecting those measurements of the position of the head which appear to me most satisfactory—namely, Auckland azimuth, 258° true, altitude 15° ; Nelson azimuth, 330° true—I find this would seem to show that the head of the streak was probably over a spot something like three hundred miles about W. by S. from Auckland—*i.e.*, over the Tasman Sea. Its altitude above the earth was something like seventy miles for a minimum, and may have been over a hundred. If the brilliant streak was vertical it was about seventy miles long, but as it was probably seen very foreshortened it was probably many times that. The riband-shaped cloud was several times as long as the bright streak, but I do not think this was due to an actual lengthening, but rather to the fact that previously invisible vapour in the track of the meteor became visible by cooling. The widening of the streak from a mere thread to a band some 2° wide was probably chiefly due to expansion. It would appear to have had a final thickness of some miles. This would indicate either a consider-

able breadth for the meteor or a prodigious temperature, perhaps both. In my opinion the meteor was not one solid mass,



but a group of many small bodies, probably derived from the splitting-up of a large mass. Apparently it must have met or been overtaken by the earth, as its course was from east to west. As the streak did not appear to reach the horizon, I conclude that the meteor did not reach the earth. It either passed through a segment of the atmosphere and away, or it was dissipated by its passage through the air. The drawing shows the appearance of the streak at the end of a quarter of an hour, as drawn by Miss Murphy. The appearance at

first would be represented on the same scale by a steady vertical line about the length of the top coil.

ART. XXV.—*Maori Eschatology: The Whare Potae (House of Mourning) and its Lore; being a Description of many Customs, Beliefs, Superstitions, Rites, &c., pertaining to Death and Burial among the Maori People, as also some Account of Native Belief in a Spiritual World.*

By ELSDON BEST.

[Read before the Auckland Institute, 6th December, 1905.]

“EVEN as the moon dies, and then, having bathed in the waters of life, returns to this world once more young and beautiful, so let man die and revive.” Such were the words of Tane, offspring of Rangi, the Sky Father, and Papa, the Earth Mother, to Hine-nui-te-Po, Goddess of Death and Hades. But Hine of the Dark World said, “Not so. Rather let man die and return to Mother Earth, even that he may be mourned and wept for.” Hence we see mourning parties of the Maori people wailing for the dead. For what said the men of old?—“By tears and lamentation alone may [a natural] death be avenged.”

Having collected some few notes anent Maori eschatology from members of the Tuhoe or Urewera Tribe, it behoves me to put such together in the form of an article, for the purpose of