common among the peasants. Such are clearly traceable to the national food, *gofio*, which in this island is made of Indian corn.

For phthisis the Canary Islands have been proved of inestimable value, and therefore on this point nothing more need be said. The temperature throughout the year, by day and by night, varies exceedingly little. In my recently-published work on these islands I have gone so fully into this question that I need not recapitulate it here.

I should not have thus ventured to trouble you had I not been asked by some leading members of the medical profession to summarize the facts, bearing upon diseases, scattered through the pages of my book and to add thereto others which I had deemed unsuitable for the general reader. OLIVIA M. STONE.

11 Sheffield Gardens, Kensington, W., December 14.

The Ffynnon Beuno and Cae Gwyn Caves.

MR. SMITH has entirely failed to substantiate the statement made by him in his letter of December 1 (p. 105) concerning the drift over the entrance of the Cae Gwyn Cave, which is 20 feet in thickness and full of ice-scratched boulders, many of large size; therefore I need only say in reply that the Geological Surveyors who surveyed this district have examined the section and have had no hesitation whatever in classifying the deposits in the section with the Glacial beds of the area. In regard to the age of river drift implements as compared with those found in the cavern, which are identical with the implements found in Kent's cavern and the French caves, I need only quote the remarks of M. Lartet ("Reliquiæ Aquitanicæ," p. 9):—"If some are inclined to attribute to the works of human industry found in the 'Diluvium' or 'Drift' a date more ancient than to those occurring in caves with a similar association of animal remains, we are obliged to remark that such a proposition, expressed as a systematic generalization, is not justifiable in any point of view." . . . "Caves were in truth the first shelter which primitive man would choose, whether driven by instinct or determined by reason."

When Mr. Smith calls the implements found in the gravels at Mildenhall, Neolithic, which others claim to be Palæolithic, and one most eminent authority to be pre-Glacial, I am perfectly justified in saying that the classification of such implements, as defined by Mr. Smith, has no chronological value, and therefore I do not think that anyone is likely to be convinced by his arguments when he is "content to resist the idea of the pre-Glacial age of these caves on purely archæological grounds."

HENRY HICKS.

Hendon, December 23.

Distorted Earth Shadows in Eclipses.

WITH reference to the peculiar appearance of the earth's shadow in the lunar eclipse of August 3 of this year, and noted by "H. H." and "M. C." (see NATURE, vol. xxxvi. pp. 367 and 413), it may be of interest to record a similar distortion observed by Capt. A. E. Barlow, on the s.s. *Nizam*, at Suez, on August 23, 1877. The following entry appears in his meteorological log:—

"The eclipse of August 23. The moon as seen at midnight at Suez. Weather fine starlight. A few cir.-c. (amount 3) travelling from northward."

The shadow was irregular and jagged as in "M.C.'s" description.

HENRY TOYNBEE,
Marine Superintendent.

Meteorological Office, December 22.

DR. BALFOUR STEWART, F.R.S.

IN the genial Manchester Professor the scientific world has lost not only an excellent teacher of physics but one of its ablest and most original investigators. He was trained according to the best methods of the last generation of experimentalists, in which scrupulous accuracy was constantly associated with genuine scientific honesty. Men such as he was are never numerous; but they are the true leaders of scientific progress:—*directly*, by their own contributions; *indirectly*, though (with rare exceptions) even more substantially, by handing on to their students the choicest traditions of a past age, mellowed by time and enriched from the experience of the present. The name of Stewart will long be remembered for more than one striking addition to our knowledge, but his patient and reverent spirit will continue to impress for good the minds and the work of all who have come under its influence.

He was born in Edinburgh, on November 1, 1828, so that he had entered his sixtieth year. He studied for a short time in each of the Universities of St. Andrews and Edinburgh, and began practical life in a mercantile office. In the course of a business voyage to Australia his particular taste for physical science developed itself, and his first published papers:—"On the adaptation of the eye to different rays," and "On the influence of gravity on the physical condition of the Moon's surface":—appeared in the *Transactions of the Physical Society of Victoria* in 1855. On his return he gave up business for science, and resumed study under Kelland and Forbes, to the latter of whom he soon became Assistant. In this capacity he had much to do with the teaching of Natural Philosophy on occasions when Forbes was temporarily disabled by his broken health. During this period, in 1858, Stewart was led to his well-known extension of Prévost's *Law of Exchanges*, a most remarkable and important contribution to the theory of Radiation. He seems to have been the first even to suggest, from a scientific stand-point, that radiation is not a mere surface phenomenon. With the aid of Forbes' apparatus, then perhaps unequalled in any British University, he fully demonstrated the truth of the conclusions to which he had been led by theory; and the award of the Rumford Medal by the Royal Society, some years later, showed that his work had been estimated at its true value, at least in the scientific world. In fact his proof of the necessary equality between the radiating and the absorbing powers of every substance (when divested of some of the unnecessary excrescences which often mask the real merit of the earlier writings of a young author) remains to this day the simplest, and therefore the most convincing, that has yet been given.

Radiant Heat was, justly, one of Professor Forbes' pet subjects, and was therefore brought very prominently before his Assistant. Another was Meteorology, and to this Stewart devoted himself with such enthusiasm and success that in 1859 he was appointed Director of the Kew Observatory. How, for eleven years, he there maintained and improved upon the memorable labours of Ronalds and Welsh needs only to be mentioned here:—it will be found in detail in the *Reports of the British Association*. Every species of inquiry which had to be carried out at Kew:—whether it consisted in the testing of Thermometers, Sextants, Pendulums, Aneroids, or Dipping-Needles, the recording of Atmospheric Electricity, the determination of the Freezing-Point of Mercury or the Melting-Point of Paraffin, or the careful study of the peculiarities of the Air-Thermometer:—received the benefit of his valuable suggestions and was carried out with his scrupulous accuracy.

About twenty years ago Stewart met with a frightful railway accident, from the effects of which he did not fully recover. He was permanently lamed, and sustained severe injury to his constitution. From the vigorous activity of the prime of life he passed, in a few months, to grey-headed old age. But his characteristic patience was unruffled, and his intellect unimpaired.

His career as Professor of Physics in the Owens College has been, since his appointment in 1870, brilliantly successful. It has led to the production of an excellent treatise on *Practical Physics*, in which every necessary detail is given with masterly precision, and which contains (what is even more valuable, and could only have been secured to the world by such a publication) the matured convictions of a thorough experimenter as to

the choice of methods for the attack of each special Problem.

His *Elementary Physics*, and his *Conservation of Energy*, are popular works on physics rather than scientific treatises:—but his *Treatise on Heat* is one of the best in any language, a thoroughly scientific work, specially characteristic of the bent of mind of its Author.

Stewart published, in addition to his *Kew Reports*, a very large number of scientific memoirs and short papers. Many of these (notably the article in the *Encyc. Brit.*, 9th edn.) deal with Terrestrial Magnetism, in itself as well as in its relations to the Aurora and to solar disturbances. A valuable series of papers, partly his own partly written in conjunction with De la Rue and Lœwy, deals with Solar Physics. His paper on the *Occurrence of Flint Implements in the Drift* (*Phil. Mag.* 1862, I.) seems to have been ignored by the "advanced" geologists, one of whose pet theories it tends to dethrone; and to have been noticed only by physicists, especially Sir W. Thomson, whose beautiful experiments have done so much to confirm it. His paper on *Internal Radiation in Uniaxal Crystals*, to which Stokes alone seems to have paid any attention, shows what Stewart might have done in Mathematical Physics, had he further developed the genuine mathematical power which he exhibited while a student of Kelland's.

I made Stewart's acquaintance in 1861, when he was the first-appointed Additional Examiner in Mathematics in the University of Edinburgh, a post which he filled with great distinction for five years. A number of tentative investigations ultimately based upon our ideas as to possible viscosity of the luminiferous medium, effect of gravitation-potential on the physical properties of matter, &c., led to the publication of papers on *Rotation of a disc in vacuo*, *Observations with a rigid spectroscope*, *Solar spots and planetary configurations*, &c. These, as well as our joint work called *The Unseen Universe*, have been very differently estimated by different classes of critics. Of course I cannot myself discuss their value. There is, however, one of these speculations, so closely connected with Stewart's Radiation work as to require particular mention, especially as it seems not yet to have received proper consideration, viz. *Equilibrium of Temperature in an enclosure containing matter in visible motion.* (NATURE, 1871; iv. 331.) The speculations are all of a somewhat transcendental character, and therefore very hard to reduce to forms in which they can be experimentally tested; but there can be no doubt that Stewart had the full conviction that there is in them all an underlying reality, the discovery of whose exact nature would at once largely increase our knowledge.

Of the man himself I cannot trust myself to speak. What I *could* say will easily be divined by those who knew him intimately; and to those who did not know him I am unwilling to speak in terms which, to them, would certainly appear exaggerated.

P. G. TAIT.

CHRISTMAS ISLAND.

PROFESSOR NEWTON sends us the following extracts from a letter received by him from Mr. J. J. Lister, M.A., St. John's College, Cambridge, the naturalist on board H.M.S. *Egeria*, Commander Aldrich, R.N., describing the recent visit to that little-known island:—

"We left Batavia on Tuesday, September 27, about 5 a.m., and were in the Straits of Sunda by the afternoon. We saw the hills on the Java side clearly, scored by many steep-sided valleys, and the green of the fields contrasting brightly with the red volcanic earth. Behind these nearer hills one of the great conical mountains loomed out every now and then from his covering of clouds. To the westward, and more distant, a high volcanic peak on the main island of Sumatra rose above nearer islands, and later in the afternoon we saw the simple conical mass of Krakatão. Next day we were bouncing about in deep blue water, as we steamed south against a head-wind—a change after the quiet sailing over the pale green shallow seas in which we had been since we entered the Straits of Malacca. On Friday, September 30, we reached Christmas Island. The first we saw of it was a long line against the south-east horizon, with a shallow saddle in the middle and a gradual rise at either end—that to the west being the higher. On nearer approach the island was seen to be uniformly covered with trees, with a low cliff, much undermined at the water's edge; above this a gradual slope leads to another steep ascent, which in some places, especially at the projecting headlands, is a bare cliff, in others covered with trees. From this there is a gradual rise to the top. We found that there is a cap of coral limestone over the whole island. The top is formed of gray pinnacled masses with steep fissures between them, and the surface of the rock is worn into a rough honeycomb with sharp points and ridges which break under foot and show the glistening white rock. On the slope of the island this rock forms horizontal terraces, with a rough slope of pinnacled masses or a sheer cliff leading down from them, and these seemed to be in a general way continuous at the same level along the side of the island. I suppose they mark the pauses in its gradual elevation during which a fringing reef has formed. Some pieces of rock, apparently volcanic, were picked up at Flying-fish Cove, but it was not found where they had fallen from.

"No stream or standing water was found. Apparently all the rain that falls soaks into the porous rock at once. The vegetation, however, looked fresh and green, and the under parts of fallen logs were sodden with moisture. On two of the nights during the ten days we were there, there was heavy rain; otherwise we had fine weather. Many of the trees are tall, reaching 150 to 170 feet or more, and some of them have vertical buttresses at the base, which wind about horizontally and give off secondary buttresses. They are often laden with great clumps of birds'-nest ferns, as well as with other ferns, orchids, and parasitical trees, and their trunks are festooned with long straight lianas. I only found two orchids with flowers out, but these were small and inconspicuous. Along the shore there are tangled thickets of screw pines, and another kind grows on the higher part. A large proportion of the trees bear edible fruits. Altogether I am sending home some fifty kinds of flowering plants and fifteen of ferns.

"The rat (*Mus macleari*) swarms on the island. They come out at dusk, and run about, in and out of the tents that were pitched by the shore, through the night. There is another kind of rat which is larger and black, except where the scanty fur on the feet allows the pale skin to show. There is also a shrew mouse, whose short shrill squeak may often be heard in the woods. I caught three of them one night in a pitfall. Several specimens of the fruit-eating bat (*Pteropus natalis*) were obtained, including males, which have no pale-coloured tippet, as Mr. Thomas [P.Z.S., 1887, p. 512] thought might possibly be the case. There is a small insectivorous bat in the island, but I did not succeed in getting one.

"The large fruit-eating pigeon (*Carpophaga whartoni*) is very common. They congregate in the fruit-bearing trees, and may then be shot by the dozen. They are excellent eating, and supplied fresh meat for the ship.

"There is a small dove—brown, with a rich bronzy-green on the back and wings—which is very common. Their habits are remarkably in keeping with their colouring. On trees they are restless and seldom seen, but on the ground, among fallen brown and green leaves, where their colour makes them very inconspicuous, they seem to have no fear. I shot seven one morning close to our place: they were feeding in pairs on fallen berries, and