as follows. One evening some years since my father, Mr. Joel Powers, while walking on Lawrence St., Lowell, Massachusetts, saw a brilliant shooting star or meteor flash downward through the atmosphere, striking the earth quite near him. He found it upon investigation to be a jelly-like mass, and almost intolerably offensive in smell. I have often heard my father allude to this event, which greatly interested him, he being a close observer and an extensive reader.

"Respectfully yours,
"ELLEN M. ADAMS."

While I am of the opinion that the mass found by Mr. Powers had no connection with the meteor that he saw, it may be well to put this piece of evidence on record in view of Prof. Hughes's paper.

FRANK SCHLESINGER.

Allegheny Observatory, July 12.

THE ETHNOLOGY, BOTANY, GEOLOGY, AND METEOROLOGY OF GERMAN AFRICA.[1]

SOME time ago, reviewing a scientific treatise on German South-west Africa and the adjoining regions I ventured to make the remark in this journal that Germany deserved to be allowed to take under her control still more of the undeveloped portions of the earth's surface, provided she continued by the direct action of her Government to enrich the world's store of knowledge as she has been doing with her African and New Guinea researches during the last ten years. The present "Mitteilungen" support this exordium; they are of high scientific value.

There is, firstly, a separate volume by Dr. Weule on his ethnographical observations in the south-east parts of German East Africa. Here, for the modest sum of three shillings (three marks), one gets a splendidly illustrated work of first-rate importance on a section of Bantu Africa. "Ergänzungsheft Nr. 2" is a dissertation by Prof. Dr. Carl Uhlig on the cartography of the German portion of the Rift Valley region of equatorial East Africa, with an appendix on the orthography of place-names in Masailand, &c., by Dr. Bernhard Struck. Part i. of Band xxii. deals with the journeys in 1905–6 of Franz Seiner in the still very little explored country between the Kalahari Desert and the Upper Zambezi (especially the valleys of the Okavango, Kwando, and Omuramba rivers); part ii., with the glaciers of Kilimanjaro, the rainfall and meteorology of the Cameroons and of German South-west Africa; part iii., likewise with the exploration of the upper parts of Kilimanjaro, the rainfall of Togoland, and the geography of Ponape Island; and part iv., with the volcanoes recently active on the Cameroons Mountains, the rainfall and meteorology of the Cameroons and of the Logone River (Shari district), the Paresis Mountains of South-west Africa, and the meteorology of the German possessions in the Pacific. The space, however, which is attributed in this collection to the German oceanic territories is so small that no further allusion to them need be made (other than to praise very cordially the extremely interesting map of Ponape Island in the Carolines Protectorate), and we might proceed at once to discuss the valuable additions to our knowledge of Africa contained in these six sections of the scientific reports attached to the Deutschen Kolonialblatte.

Dr. Weule's work in East African anthropology has already been made known to English readers by Miss Alice Werner in a translation of his more "popular" account of his travels and in various papers in the Journal of the (British) African Society. It was remarked in one or other of these publications that Dr. Weule's work was a little impaired by his apparent unacquaintance with his subject before embarking on this expedition to East Africa. Had he studied more the numerous works in German and in English dealing with the native tribes of the southern portions of German East Africa and of British Nyasaland, he would have avoided a certain *naïveté* of discovering what had already been made known and a few blunders into which he had fallen through a lack of comparative knowledge; also that his orthography of native names was a little old-fashioned (in its German rendering) and divergent from the methods of spelling adopted long ago by German and British philologists and travellers.

These criticisms are less applicable to the volume under notice, "Wissenschaftliche ergebnisse meiner ethnographischen Forschungsreise in den sudösten Deutsch-Ostafrikas"; though the orthography still irritates and the many painstaking quotations of native speech in the dialects of Yao and Makua would have been the better for careful revision with German or British experts. (They tend to incorporate too much the Swahili words of some intervening interpreter.) But the greater part of this book is interesting and valuable to the ethnologist. The illustrations which accompany it are deserving of unstinted praise. Photographically (for the most part) and by clever draughtsmanship, Dr. Weule depicts the physical types of the Wa-mwera, A-makua, Wa-yao, Wa-makonde, Wa-matambwe, and Wa-ngoni peoples of the Ruvuma basin; their costumes, ornaments, and hideous self-inflicted deformities (such as the monstrous "pelele," or lip-disc, worn by nearly all the women in this region); their houses and methods of building; their graves, fetish-huts, granaries, cooking arrangements, doors, wooden locks and keys, pottery-making, metal-work, bark-cloth felting, basket- and mat-making, salt-straining; their weaving of cotton cloth and remarkable wood carving and calabash engraving. Indeed, he reveals a new chapter in negro art by his illustrations of their statues in wood, their clay dolls, their sculptured birds, Rhynchocyon insectivores, pigs, monkeys, and dogs; their most artistic carved snuff-boxes, amulets, powder-boxes, spoons, and stools. (As regards the last it is interesting to note the striking resemblance in shape and design to those of the south-eastern basin of the Congo.) One arises from this survey (and after reading the accompanying text) convinced that with due encouragement some section of the negro race is going to astonish the world yet in design and sculpture.

Then there are the extraordinarily ingenious traps, snares, and pitfalls, all most clearly and yet picturesquely illustrated. Elephants are sometimes killed by the falling of a heavily-weighted harpoon from a lofty tree-branch or scaffold which they release by the displacing of a cord; the larger antelopes similarly discharge arrows or assagais into their own bodies; the smaller quadrupeds dislodge in their passage a heavy beam which falls and crushes them. There are springes and nooses for the capture and strangling of beasts and birds, and cages for catching them alive; rat-traps and hyena-traps. All these display an ingenuity, a neat-handedness, and an unconscious knowledge of dynamics very remarkable in people still living ostensibly as semi-savages. One realises in studying Dr. Weule's work how it was that, although the fossil remains of *Homo primigenius*—and the negro stands higher as a subspecies of *Homo sapiens*—exhibit an osteology approximating slightly to the anthropoid apes, yet the brain capacity of any type of the genus Homo is almost of necessity an average

[1] Mitteilungen aus den Deutschen Schutzgebieten, &c. Ergänzungshefte Nr. 1, pp. x+150+Tafel 63; und 2, pp. iv+62. Heften i. bis iv., Band xxii. Edited by Dr. Freiherr von Danckelmann. (Berlin: Ernst Siegfried Mittler und Sohn, 1909.) Price 3 marks each.

minimum 1100 c.c.[1] to enable anything like a man to compass the degree of thought and reflection necessary to adroit use of implements and the contriving the death or capture of their prey.

Dr. Weule goes very fully into the boy and girl initiation ceremonies among the tribes above-mentioned. He seems to have omitted none of the details of these rites, all of which, whether excessively obscene, prophylactic, or rudely moral, are yet instinct with a certain feeling of natural religion: that is to say, they are performed not for their incidental lubricity but with the intention of making the girls good wives and mothers and the boys vigorous husbands and faithful members of the clan. Still, as regards the young women, native therapeutics[2] are entirely at fault, and the missionaries are quite right in believing and teaching that these "Unyago" ceremonies are in reality detrimental to health and morals.

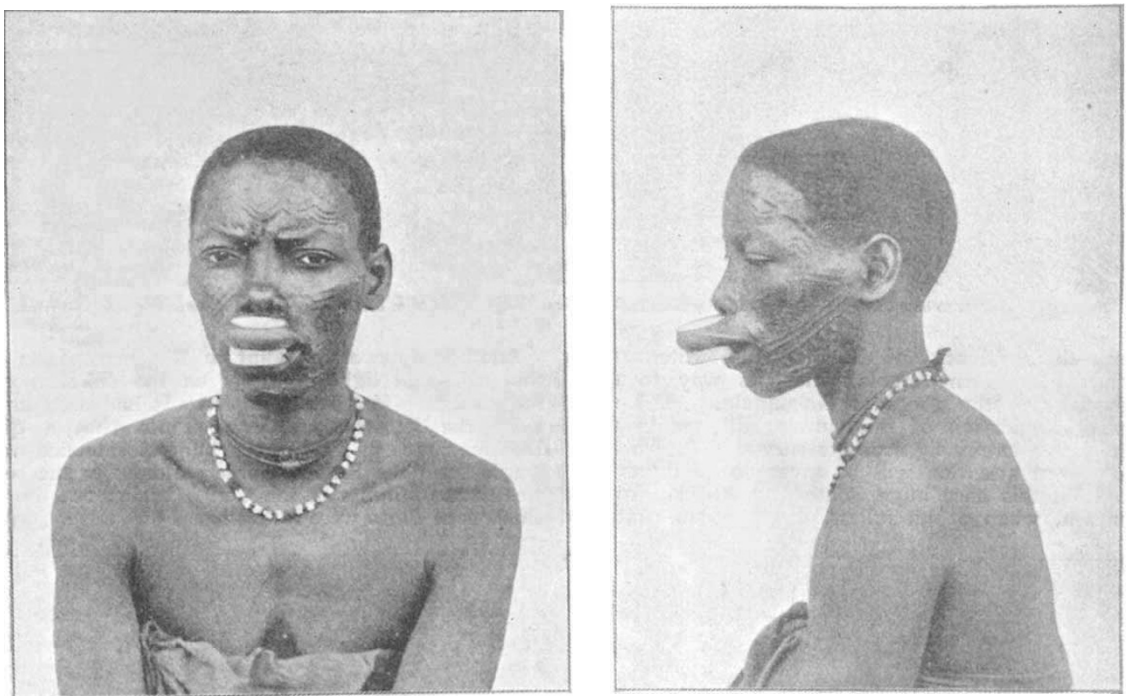

FIG. 1.—Young Makonde Women. Reproduced from *Mitteilungen aus den deutschen Schutzgebieten.*

The elaborate dances and their meanings, the strange dancing masks, the birth, marriage, death, and burial ceremonies are all described in detail, and a good deal of this information is absolutely new. Altogether Dr. Weule has made an important contribution to our knowledge of the still primitive Bantu tribes of the Ruvuma country, and incidentally has supplied some charming pictures of this great East African river; first studied by Livingstone in the vain hope that it might prove to be a water-route to Central Africa.

Prof. Uhlig's cartographical information on the German end of the Rift Valley is an important addition to our geographical knowledge of this somewhat desolate part of East Africa, a region, however, which is coming into such importance for the salts, phosphates, and sodas of its evaporating lakes that the British are building a branch railway to tap its products from the north. The human population is scanty, and consists mainly of Masai; and the Masai having long ago named all the leading features of the landscapes, Dr. Bernhard Struck (the well-known philologist) contributes an article on Masai place-names and on the correct orthography of African words. It is, indeed, a pity that all civilised nations cannot agree to adopt a uniform phonetic alphabet for such purposes. Of course, the basis for such a system is best found in the Lepsius standard alphabet, with certain slight changes. As Lepsius was a German, one would think that the Germans would agree with us in adopting his system. But no: there are two schools at present in the Fatherland: one that sticks to the old-fashioned German extravagance in consonants—the *dsch, tsch, ä* for *e,* doubled *s's, s* for *z* plan—still used by Dr. Weule; and the over-particular new German linguists and geographers who fatigue and dishearten the average student with their meticulousness in spelling, their accents, diacritical and elliptical marks, their circumflexes, dots, underlinings, and other cabalistic signs. Why cannot all the world agree to confine itself to such a phonetic alphabet as that adopted and used by the great German explorer in the service of the British Government—Henry Barth? In the humble opinion of the reviewer Barth's system is about perfect in accuracy and simplicity. It is, of course, founded on the alphabet devised by Lepsius.

Another important piece of African research is Herr Seiner's journey of exploration in that still little explored country bounded by the Upper Zambezi on the east, the Kunene River on the north-west, and the Kalahari desert on the south, the region separating the Bechuana peoples from the Herero stock (Amaherero, Ovambo, &c.), and the Herero from the Zambezian peoples (Ba-luyi, Basubia, Batonga, &c.). The hydrography of this region is still an unsolved problem. There is, first of all, the isolated basin of Lake Etosa in north-east Damaraland; then come the questions of the Ngami-Botletle-Makari-kari system, the real destination of the waters of the immense

[1] The cranial capacity of the Neanderthal skull was about 1500 c.c.
[2] Such as in the artificial hypertrophy of the *labia minora.*

river system of the Kubango (Okavango)-Kuito-Omurambo and Kwando. These rivers discharge the bulk of their waters into the remains of an ancient sea, of which the Haiñoma-Selinda-Mashi swamps, the network of the Tauche streams, Lage Ngami, the Botletle River, and the Makari-kari salt-pans are the vestiges; but by two separate overflows—the Mashi-Linyanti river-swamp and the Tamalakane outlet of the steppe flora of so much of irregularly watered tropical Africa, and the rich forest and swamp flora of West Africa. Seiner traces the approximate limits of each phytogeographical region: the southernmost boundary of the baobab tree, of the bulging-stemmed Hyphæne palm (*H. ventricosa*), of the high-timber forests of West African affinities, and the thin, low-growing woods of Copaifera and Burkea.

FIG. 2.—Arrows set to be discharged automatically by animals, Usagara. Reproduced from *Mitteilungen aus den deutschen Schutzgebieten.*

Ngami—the surplusage of the Okavango waters (the drainage of eastern Angola) finds its way to the Zambezi above the gorge of Kasungula. But the complete elucidation of this puzzle still awaits the results of an extremely accurate survey in which the most careful attention will be given to questions of level. Did this once huge South-west African fresh-water sea, when at its fullest, discharge its waters seawards through the Limpopo; or did it pierce the hills at Kasungula (some distance above the Victoria Falls) and thus united what is now the Upper Zambezi with the Gwai and the Kafue, and so create the Zambezi as we know it to-day? Herr Seiner's journey was singularly interesting because of his careful studies of plant-distribution. In this region meet the desert flora of the Kalahari and South-west Africa,

Another noteworthy point in this exploration was the additional light it threw on the distribution of the Bushman-Hottentot peoples. It had been known since the journeys of Serpa Pinto that a quasi-Bushman race of red-skinned hunters extended northwards from the Kalahari desert almost to the south-westernmost limits of the Congo basin; but the conclusions of Pinto were rather based on fancied physical resemblances than on language. Dr. Passarge—the German explorer who has made several journeys through the Okavango basin—added to our information, and now Seiner extends our knowledge of these people, speaking click languages, to the Kwando River and almost to the Upper Zambezi. The specimens of Bushman speech collected by Seiner and Passarge enable these travellers to divide the

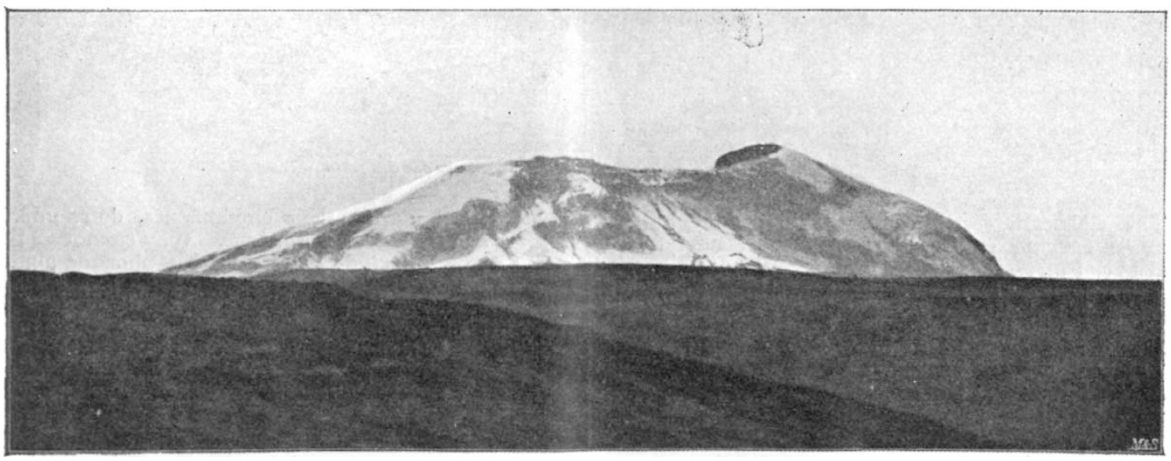

FIG. 3.—The Kibo Crater of Kilimanjaro. View from the base at a distance of 3932 metres. Reproduced from *Mitteilungen aus den deutschen Schutzgebieten.*

northern Bushmen into two groups—that of the Kaukau of southern Damaraland and that of the Ngami, which would include the click-using peoples as far north as the Kwando River. Between the two groups there is very considerable linguistic difference, though there exist equally undeniable affinities. In Herr Seiner's photographs, however, only two examples of so-called Bushmen are recognisable as such, the remainder (though their language was "Bush") are obviously true negroes, and must be the result of hybrids ancient and modern with the true negro stock, as exemplified by the recent Bantu invaders (Bechuana and Zambezian) and the Berg-Damàra. Seiner classifies the Zambezians as "Bantu," and the Bechuana as a class apart. There is no justification for this distinction. The Bechuana tribes are just as much "Bantu" in languages as the Zambezians, though some of them have obviously absorbed a good deal of Bushman blood during the last twelve or fifteen hundred years.

The descriptions and beautiful pictures of the Kilimanjaro glaciers (in parts ii. and iii. of Band xxii.) are of the highest interest; so also are the equally careful, illustrated reports on the "volcanelli" (if one may coin a word to describe the lesser craters which break out on the mass of a huge volcano) of the Cameroons. This article, by Dr. Otto Mann, describes the renewed activities of the Cameroons volcanic mass in 1909. H. H. JOHNSTON.

CORDITE.

THE recent discussion in Parliament on our supplies of cordite and our productive capacity for this type of smokeless powder has naturally directed public attention to these important questions. The production of a smokeless powder was ever the dream of the military strategist, and with the discovery of gun-cotton the conclusion was hastily arrived at that the ideal propellant was found, only to be rudely dissipated by numerous serious disasters. Gun-cotton for many years resisted all attempts to render its combustion sufficiently under control for it to be adopted as a propellant, yet to-day it is the basis of the smokeless powders of all nations. Its early failures were entirely due to the retention in the nitrated cotton of the physical characters of the parent cotton, for even after reduction to an extremely fine state of division during the process of manufacture, the fibrous nature of the cotton persisted. Success has only been attained by the destruction of this fibre, and the smokeless powders of all nations may be classed either as simple gelatinised gun-cottons in which soluble nitrocelluloses have been gelatinised by treatment with an ether-alcohol mixture, or as nitrocellulose-nitroglycerine colloids, in which the nitrocellulose employed may be of the soluble variety, as in ballistite, or the insoluble (true gun-cotton), as in the case of cordite.

The introduction of blasting gelatin by Nobel (1875), consisting of some 90 per cent. nitroglycerine with 10 per cent. of soluble nitrated cotton in a gelatinised form, was the first step towards the production of powders of the cordite type. The high percentage of nitroglycerine rendered blasting gelatin unsuitable for use in guns, but by incorporating the two constituents in equal quantities, Nobel gave to the world the first successful smokeless powder of this class, ballistite. Cordite was the outcome of the work of a committee presided over by the late Sir Frederick Abel, and was patented a year later than ballistite, in 1889. The essential difference between ballistite and cordite is that whilst the former contains soluble nitrocelluloses, cordite contains the insoluble or tri-nitrocellulose. This change in the character of the nitrocellulose employed entailed the introduction of acetone in the manufacture of cordite. Soluble nitrocotton and nitroglycerine can be thoroughly incorporated under proper conditions in the presence of water without the aid of any solvent, but the ingredients of cordite can only become perfectly incorporated in the presence of a mutual solvent. It is essential that the solvent shall be sufficiently volatile to permit of its removal at reasonably low temperatures from the finished powder, and acetone, which boils at 56° C., fulfils all the conditions best.

It is important to note that nitroglycerine is the only explosive containing an excess of oxygen, all nitrocelluloses being theoretically deficient in this element to give complete combustion of carbon to carbon dioxide and hydrogen to water. There are therefore admirable theoretical grounds for the incorporation of these two explosives with each other. The total change in physical characters of both nitroglycerine and nitrocellulose brought about entirely alters the character of their explosion; singly, both constituents are beyond control once combustion is started; gelatinised together, combustion is regularly progressive throughout the mass, an essential condition for a propellant.

The earlier form of cordite consisted of nitroglycerine, 68 per cent.; nitrocellulose, 37 per cent.; vaseline, 5 per cent. It was soon found that serious erosion took place in the guns, and Sir Andrew Noble showed this to be due to the rapid motion of the gaseous products at very high temperature. Since the temperature is a function of the nitroglycerine content, combustion to carbon dioxide taking place to greater extent with its accompanying higher calorific intensity, it followed that reduction of the nitroglycerine would lower the temperature of the products and lessen the erosion. This led to the introduction of modified (M.D.) cordite of the following composition:—Nitroglycerine, 30 per cent.; nitrocellulose, 65 per cent.; vaseline, 5 per cent.—practically a reversal of the former proportions of the chief ingredients. The introduction of the vaseline was made to overcome metallic fouling in the gun, arising from surfaces of metal in practically a clean condition rubbing against each other as the projectile moved outward. The vaseline decomposition products provided just the slight lubrication needed. It has performed another important office, little thought of on its introduction, in acting as a "stabiliser" in the cordite.

In the manufacture of cordite, the gun-cotton employed is thoroughly dried at a temperature of 40° C., and is then mixed by hand with the proper proportion of nitroglycerine, the mixture being finally passed through a sieve. The "paste" obtained is transferred to an incorporating machine of an exactly similar type to that employed in a machine bakery, except that temperature control is arranged for, and there worked into a thorough dough with the requisite quantity of acetone. The first kneading occupies about three and a half hours; then the vaseline is added and a further kneading for a similar period takes place. "Cordite dough," in which every trace of the fibrous character of the gun-cotton has disappeared, results, and this dough is then shaped into the finished threads, cords, or rods by pressure through suitable dies. As the thinner makes pass from the press they are wound on drums, thicker qualities being cut into suitable lengths as they pass out on an endless band. The acetone remaining must now be removed by drying in suitable rooms at a temperature of 110° F. The removal of solvent from the larger sizes of all smokeless powders offers considerable difficulty owing to their horny nature; the odour of acetone is readily detected in freshly ground cordite after long storage.