ties, even the characters of families and genera, are almost entirely omitted, but the amount of practical information is nearly as great as that to be found in the more bulky work of Mr. Barrett, who dealt with about 100 species in each volume. No popular book, of course, can compete with the huge encyclopædic work of Mr. Tutt; but then he often devotes 40 or 50 pages of very closely printed but large 8vo. pages to a single species, and his work is only slightly illustrated. Mr. South, however, gives us a profusion of admirable illustrations, and much bulk is saved by an arrangement by which the plates (except the frontispiece) are on opposite sides of the same leaf, in most cases coloured figures of moths occupying one side and plain figures of transformations the other. The introduction is good, and includes useful figures of antennæ and wing-markings, &c., and also remarks on collecting.

The general arrangement followed is that of Staudinger's catalogue of 1901. One point of interest in successive works on British Lepidoptera is the shifting of localities for species, combined with the actual extinction of some, and the discovery or naturalisation of others. The comparison of a series of successive works like those of Petiver, Haworth, Stephens, Westwood and Humphreys, Stainton, and Barrett would bring this out very strongly. Most of the best localities of the older London entomologists has been built over or otherwise destroyed; the best locality for "blues," &c., near Brighton, is now turned into allotments; and several species of butterflies and moths common in many parts of England only fifty years ago are now on the verge of extinction as British species.

We must not omit to mention that Mr. South does not share Stainton's prejudice against English names. In Stainton's time it might have been necessary to discourage their use as against that of Latin names; but at present the latter are so familiar that it is no longer necessary. One suggestion we should like to make. The index is good, but we think a table of contents would also be useful; and if restricted to headings and families, it need not occupy more than a single page. W. F. K.

Physiologie und Anatomie des Menschen mit ausblicken auf den ganzen Kreis der Wirbeltiere. By Dr. Felix Kienitz-Gerloff. Pp. vi+130. (Leipzig: B. G. Teubner, 1907.) Price 3 marks.

THIS is a small elementary text-book with a scope similar to that of Huxley's "Elementary Lessons in Physiology." It presents clearly and accurately the main facts of physiology and anatomy from a general educational point of view. While the skeleton, muscles and joints are dismissed with appropriate brevity, the central nervous system, sense organs, excretory organs, and the alimentary, respiratory, and circulatory systems are treated in some detail. As opportunity offers, matters pertaining to general health find suitable mention. The text is lightened by frequent and interesting references to comparative anatomy. The illustrations are taken from standard text-books of anatomy, and are both numerous and well chosen. Although the book is primarily intended for students in a school of agriculture, it ought to have a wide and general circulation. W. W.

The Elements of Geography. By J. H. N. Stephenson. Part i., General Geography. Pp. xiii+160; with illustrations and maps. (London: Edward Stanford, 1908.) Price 3*s.* 6*d.*

WHAT Mr. Stephenson describes as "general" is more commonly known among teachers as "physical" geography; but since an understanding of the broad principles with which he deals in this attractive book must precede a study of the geography of special areas, his title sufficiently describes the character of his chapters. The section styled "organic" geography will prove especially useful to teachers as indicating the way in which man's development has been modified by his surroundings, and the manner in which man in his turn has influenced the character and distribution of life on the globe. The book is exceptionally rich in well-executed maps which will increase greatly its usefulness as a class-manual. The volume may be recommended to the careful attention of teachers of geography.

Lehrbuch der Chemie und Mineralogie für die vierte Klasse der Realschulen. By Franz von Hemmelmayr and Dr. Karl Brunner (the Mineralogical Portion by Heinrich Leitenberger). Third edition. Pp. 180; with two coloured plates. (Vienna: F. Tempsky, 1906.) Price 2kr. 10hel.

THIS is an elementary class-book for use in the fourth class in the Austrian State schools, that is, for boys of about twelve or thirteen years of age. It covers much the same ground as the usual elementary class-books on chemistry. In the longest portion of the book, that on inorganic chemistry, however, there are added brief descriptions of the more important minerals which yield the elements under discussion; the pupil is thus at the same time told how chemical compounds and elements occur in nature. Figures are given of crystals of these minerals, but several of them have been placed upside down in the text. There is a short section on organic chemistry, in which prominence is given to compounds of everyday use. The book is very well and clearly printed on good paper.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.]*

The Cotton Plant.

THE full acknowledgment Sir George Watt has given to the slight assistance which I was able to afford him—in those portions of his book which deal with Egyptian cotton—renders criticism difficult, but there are a few points arising from Lieut.-Colonel Prain's recent letter (February 6, p. 318) which seem to call for comment.

While not possessing any general knowledge of the genus Gossypium, I have had occasion during the last three years to grow, and to examine in some detail, a number of pedigree cultures of Egyptian cotton—as well as of Uplands and others—in researches on Mendel's law. One result of this work is that I can fully endorse your reviewer's argument that the cotton plant can be studied successfully for systematic purposes in living material only. The herbarium method has many limitations, the most conspicuous of which is perhaps the tendency to take the extreme form of some character which has a large range of fluctuation as the differentiating mark of a variety or species.

Colonel Prain affirms that the ideas of your reviewer as to the meaning of the terms "species" and "variety" do not accord with accepted usage. My general position is the reverse of Colonel Prain's, in that I am unable to obtain any idea as to the nature of species in the genus Gossypium by studying the names accorded by Watt to certain plants with which I am acquainted. A particular case is that of the Sudanese tree cottons from Senaar, referred to in the "Wild and Cultivated Cottons of the World" by my numbers 213–1 and 213–2 (pp. 113 and 138). These were supplied to me by Mr. A. G. Braun, of the Woods and Forests Department, Khartoum, in a

sample of seed which had been sent from Senaar Province. This sample was sown at Ghizeh, and the material sent to Kew was taken from two adjacent plants in the same row, these being plants developed from embryos which had ripened on a tree in Senaar. The reason for sending material from two different plants was because this row showed two distinct leaf-forms, some of the plants having much wider leaf-lobes than the others, and these two types were represented by 213–1 and 213–2. In no other respect could any distinction be drawn between the two types, at least on any character within my grasp; moreover, they all flowered within the same week, ripened within the same week, grew to a remarkably uniform height, and had similar habits of growth; with the one exception of the leaf-shape they were far more alike than a similar group of plants taken from a field of any variety of Egyptian cotton. These two forms were separated by Watt into *G. arboreum* and *G. Nanking*, because "a yellow-flowered *G. arboreum* with deeply laciniate bracteoles and three glands on the under surface of the leaf would destroy the specific isolations" (p. 138). I incline to think that the laciniation of the bracteoles and the glandulation of the leaves should have been made the subject of comparative study—in order to ascertain their capacity for fluctuation—before such erratic characters were entrusted with the responsibility for this violent separation of the two forms into two separate species. Such comparative study would at least have been commenced had these plants been seen growing side by side in my plot.

On the other hand, we find on p. 181 that Moqui Indian cotton from Arizona (209–3) and "Hindi" weed cotton of Egypt (55 A) are placed together under *G. punctatum*. Waiving the query as to why Hindi, a naked-seeded cotton, should be placed in the fuzzy-seeded section, I should like on other grounds—but in all diffidence—to advance the opinion that if the two strains could be grown together at Kew, or examined side by side on my plot in Egypt, they would be systematically removed from one another by a wide interval.

The employment of common names has also been mentioned by Colonel Prain; the following instance, therefore, does not seem altogether pointless:—the plant referred to as 56.C.2 (p. 224) came from a sample of Afifi cotton, and bears lint of the brown Afifi colour; this colour is the characteristic and sole morphological distinction of Afifi from Abbassi, the latter bearing white lint, so that 56.C.2 could by no possibility be described legitimately as "close to Abbassi or Afifi."

The cultivated varieties of Egyptian cottons—and probably of Uplands—consist of many different strains mingled together and cross-fertilised, resembling one another in a few obvious characters of economic importance. Thus, on p. 224, Watt describes the strain 142, plant A, as being distinct from the Abbassi plant described in par. 2 of the same page. In point of fact, No. 142 was taken from a prize sample of Abbassi.

Though I wish to see an exact method adopted for the investigation of this labyrinthine genus, such method to be based on pedigree culture and statistical inquiry, I am nevertheless grateful to Sir George Watt for having gathered together the mass of detailed information which is to be found in his book, and I hope—with Colonel Prain—that we shall not have to wait long for the publication of further researches on the subject.

W. LAWRENCE BALLS.

Cairo, February 27.

IN the courteous letter in which Mr. Balls exercises his right to criticise details in Sir G. Watt's work on cotton, as to which he considers himself a competent judge, he gives expression to some misapprehension that it may be well to remove.

It has not been affirmed that the ideas of the writer of the review which appeared in NATURE for January 16 as to "species" and "varieties" do not accord with accepted usage. What it was necessary to point out was that the reviewer had not made it clear that his interpretation of these words accords with accepted usage. There are two passages in the review in which the words are dealt with together; in one passage they are so used as to imply that the status of a variety is the same as that of a species; in the other they are so used as to indicate that a species is subordinate in status to a variety. The ideas of the reviewer may be as precise as those of Mr. Balls; they may, on the other hand, be as loose as his own phraseology; he has given us no means of deciding.

The position assumed by me has already been explicitly stated. I have reserved perfect freedom of judgment as regards the acceptance of Watt's conclusions, not as to the limits of species in the genus Gossypium alone, but as to all the issues involved. When he explains that his general position is the reverse of this, it will be felt that Mr. Balls does himself an injustice.

The name of the distinguished public servant referred to by Mr. Balls is Mr. A. F. Broun, and is not as given in Mr. Balls' letter.

D. PRAIN.

The Isothermal Layer of the Atmosphere.

IN his letter in NATURE of February 27 Mr. Dines asks why the adiabatic conditions which prevail in the lower part of our atmosphere should suddenly cease at a height of about 40,000 feet. The answer comes more readily if the question is altered to, Why does the isothermal condition of the outer layers of our atmosphere suddenly cease at about 40,000 feet? The isothermal condition or even increased temperature with height is the condition which would naturally prevail in an atmosphere surrounding a smooth sphere. For if the sphere is a very hot one its entire gaseous envelope should acquire its temperature, whereas if the solid sphere, like our earth, is cold, and if heat from the sun is warming the atmosphere by radiation, one may expect the outer layers to be warm and the lower layers to be the coldest ones. If, however, there are irregularities, as, for instance, mountain chains on the earth's surface, then the air, whenever it is forced over them, parts with its moisture as it rises on the one side and then descends on the other side as a dry and hot *Foehn*, in which wind the conditions are perfectly adiabatic, the temperature gradient rising steadily with decreasing height. It seems, therefore, that it is our mountain ranges which prevent the isothermal condition from descending below the height at which effective mixing or moisture removing occurs.

This leads to the conclusion that if at one time our mountain ranges were lower than at present, the isothermal condition and its low temperature will also have been lower than at present. This may have been the case during Glacial periods. On the other hand, during tropical periods our mountain ranges may have been higher than they are at present; the isothermal condition will have ended at a higher level, and the steady rise of temperature below this boundary will have resulted in a very high temperature on the earth's surface.

I remember discussing this subject about twenty years ago at Aix-la-Chapelle with Dr. A. Ritter, who had only recently in Wiedemann's *Annalen* (vols. v.–viii., "Heights of Atmospheres and Conditions of Nebulæ") dealt with it very exhaustively. If I am not mistaken, it was the *Foehn* wind which had first led to these inquiries, but, strange to say, Dr. Ritter relied on molecular motions for the necessary mixing of the layers. This may have been due to his feeling that if isothermal conditions were conceded, an interstellar atmosphere would have to be postulated. We therefore almost naturally disagreed as to the possibility of condensing the so-called permanent gases, which fact had not then been accomplished. My view was that if nitrogen and oxygen should be condensable, and if the adiabatic condition existed up to the outer limits of our atmosphere, then, at the zero temperature to be found there, both gases would condense and sink to the lower levels, to be followed by further and further layers until the whole atmosphere would be deposited on the earth's surface. Dr. Ritter merely pushed this difficulty further away by saying that, even if oxygen and nitrogen could be condensed, our atmosphere might nevertheless be surrounded by hydrogen. Now that hydrogen has been condensed, helium would have to take its place, or, and this is a view not easily accepted, our earth may be surrounded by a very attenuated and possibly warm interstellar atmosphere. I think that the recent experiments