in the influence they exercise on the thought and memory of him who compiles them, yet it is impossible to ignore the fact that, in these days of many examinations, there is a persistent demand for works of the class. It is well, therefore, that books of the kind should be prepared with reasonable intelligence, and with such care against the propagation of glaring and misleading errors as the author of this work has certainly shown. It would undoubtedly be better that the *teachers* should prepare their own lecture-notes, with illustrations derived from personal reading and study; and no less desirable is it that the *taught* should make such notes of the facts referred to in illustration of the lessons given them, as to be able to recall to their minds the arguments of the teacher, and the principles which he has aimed at enforcing. For teachers and students who are incapable of following this very obvious and desirable method, however, notes and tables of the kind before us certainly have their use. Mr. Gwinnell's book is happily free from the gross absurdities and mistakes so common in many of the books prepared with the avowed aim of meeting the wants of those preparing for examination; and, for those who must have a crutch, we may admit that this is a very excellent one of its kind. We have noticed a few unfortunate errors, such as the statement that granitite contains pink orthoclase, and that graphic granite consists of "quartz and felspar arranged in lines like writing." The pretty geological map of Great Britain forming the frontispiece, too, which has been adopted from a work that appeared a good many years ago, exhibits nearly the whole of the Scottish Highlands as consisting of Lower Silurian rocks. On the whole, however, the book has the merit of being accurate and up to date, and the author is entitled to the praise of having very carefully selected, arranged, and verified the mass of miscellaneous information which he has brought together.

La Période Glaciare: Étudiée principalement en France et en Suisse. Par A. Falsan. (Paris: Felix Alcan, 1889.)

THIS volume, which is the most recent addition to the collection of the "International Scientific Series," published in the French language, contains a most admirable *résumé* of facts and opinions bearing upon the Glacial period, as illustrated in France and Switzerland. The author shows a very extensive acquaintance with the immense body of literature dealing with glacial questions, by English, American, German, and Scandinavian geologists; and very fairly and temperately discusses the bearings of the numerous theories that have been put forward upon the facts observed in France. As the references to original memoirs are very full and complete, the work cannot fail to be of much value to glacialists and geologists in general, while it admirably fulfils its main object, that of giving an accurate and popular account of the current knowledge and opinion of geologists upon glacial questions, especially adapted to the want of French readers.

Even when compelled to express his dissent from extreme views upon such questions as the recurrence of glacial periods in past geological times, the influence of glaciers in excavating lake basins, and the existence of man in Tertiary times, M. Falsan clearly states the grounds on which conclusions different from his own have been arrived at by other authors. In his presentation of the arguments for and against the various glacial theories, his moderation and his fairness are alike conspicuous.

The author of this book has taken an active part in the important work of preserving the most conspicuous of the fine boulders scattered over France; and numerous sketches of these boulders, with many interesting details concerning them, find a place in these pages. Two plates, a map showing the former extension of the French glaciers, and a series of sections illustrating the former dimensions of the Rhone Glacier, accompany the work; but the other engravings are wanting in the beauty and finish so often found in books published in France. The very full table of contents does not compensate for the total absence of an index to the book.

Physiological Diagrams. With an Index. By G. Davies. (Edinburgh and London: W. and A. K. Johnston, 1889.)

THESE diagrams are designed for use in schools, and to "supply the teacher with a means (by teaching the pupils to draw from them) of impressing the form and organs of the different parts of the body on the pupils' minds." There are nine in all (each 22 × 30) printed in black upon cardboard, with eyelet holes for hanging purposes. The parts are represented in hard outline, each being numbered, in accordance with a series of explanatory reproductions in miniature, which accompany the "text." The whole production is most feeble. It is only when the author relies upon standard works that his diagrams are tolerable, and his only really useful sheet (No. 1) is a copy. Seeing that much better wall diagrams have long been before the public, we are at a loss to see any *raison d'être* for these poor apologies. We are told that "the principal object of these drawings is to facilitate the teaching of physiology in schools." So much the worse for the schools! We cannot congratulate either author or publishers upon their venture. The day is past in which anything in outline will pass current for an atlas; and pictorial aids to the teaching of elementary physiology, to be of any service, must be produced by competent authorities.

Woolwich Mathematical Papers, 1880–88. Edited by E. J. Brooksmith, B.A., LL.M. (London: Macmillan and Co., 1889.)

IN this book we have a collection of the various papers in mathematics prepared during the last eight years to test the knowledge of candidates for admission into the Royal Military Academy. The subjects are: geometry, arithmetic, algebra, plane trigonometry, statics, and dynamics. The volume will prove most useful to those who intend entering for these examinations, and will also be of service to many teachers in our public and private schools. The answers to the examples in the various papers are collected together at the end.

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.*]

Head Growth in Students at the University of Cambridge.

UNDER the above heading there appeared in NATURE, vol. xxxviii. p. 14, an article in which certain very weighty conclusions are drawn from grounds which I hope to show are quite inadequate. These conclusions are as follow:—

(1) Although it is pretty well ascertained that in the masses of the population the brain ceases to grow after the age of 19, or even earlier, it is by no means so with University students.

(2) That men who obtain high honours have had considerably larger brains than others at the age of 19.

(3) That they have larger brains than others, but not to the same extent, at the age of 25; in fact, their predominance is by that time diminished to one-half of what it was.

(4) Consequently "high honour" men are presumably, as a class, both more precocious and more gifted throughout than others.

These conclusions were deduced from measurements taken in the following way. The maximum length, width, and height (above a specified plane) of the head are taken in inches and decimals of an inch. Since the quantities lie between 5 and 8

age, it would probably be found that a not insignificant proportion of those marked as 25 were men who were already older when they came into residence. J. VENN.

ABOUT eighteen months ago a brief memoir of mine—"Head Growth in Students at the University of Cambridge"—read before the Anthropological Institute, was published in NATURE (vol. xxxviii. p. 15). The *means* obtained by Dr. Venn, of the "head-products" of Cambridge students between the ages of nineteen and twenty-five were there thrown into the form of a diagram, and discussed. The head-product, I may again mention, is the maximum length of the head, × its maximum breadth, × its height above the plane that passes through the following three points: 1 and 2, the apertures of the ears; 3, the average of the heights of the lower edges of the two orbits. I drew curves that appeared to me to approximately represent the true average rate of growth, and deduced from them the following conclusions, in which I have now interpolated a few words in brackets, not because any criticism has been founded on their omission, but merely as a safeguard against the possibility of future misapprehension.

(1) Although it is pretty well ascertained that in the masses of the population the brain ceases to grow after the age of nineteen, or even earlier, it is by no means so with University students.

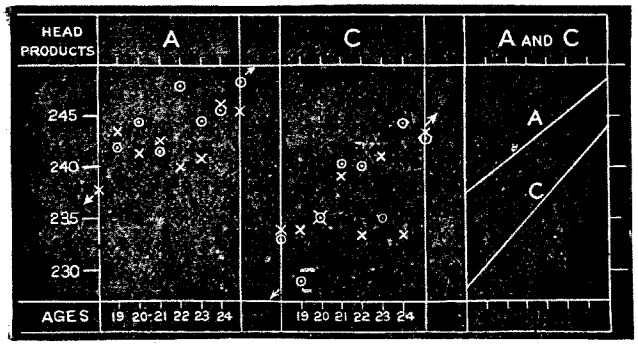
(2) That men who have obtained high honours have had [on the average] considerably larger brains than others at the age of nineteen.

(3) That they have [on the average] larger brains than others, but not to the same extent, at the age of twenty-five; in fact, their predominance is by that time diminished to [about] one-half of what it was.

(4) Consequently, "high honour" men are presumably, as a class, both more precocious and more gifted throughout than others. We must therefore look upon eminent University success as [largely due to] a fortunate combination of these two helpful conditions.

These conclusions have been latterly questioned by two of your correspondents, partly on the ground of discordance among the data, and partly on that of insufficient accuracy of the individual observations. To this I replied, that materials had since been accumulating, and that a second batch of observations, about equally numerous with those in the first, were nearly ripe for discussion, and that I thought it better to defer discussion until these had been dealt with; then, their agreement or disagreement with the first batch would go a long way towards settling the doubt.

This second batch of observations has now been discussed by Dr. Venn on exactly the same lines as the first one, and I give the results of both in the annexed diagram. The data from the



first batch, which formed the basis of the above-mentioned memoir, are here shown by dots with little circles round them; those from the second batch by crosses.

To the best of my judgment, the conclusions that were reached before are now confirmed. No person can, I think, doubt that the swarm of the A dots, and that of the C dots, are totally distinct in character. I have avoided drawing curves through either of them, lest by doing so the effect of the marks, when standing alone, should be overpowered, and it might be prejudiced. In their place, small arrow-heads are placed outside each diagram, to indicate the direction of the stretched thread that seemed most justly to represent the general trends of the two swarms of dots. Then, for the sake of convenient comparison, lines corresponding to these threads have been placed on the third diagram. It must, however, be understood that I have supposed the lines to be drawn straight, merely for convenience. In making my own final conclusions, I should take into account not only what the swarms of dots appear by themselves to show, but also the strong probability that the rate of head-growth diminishes in each successive year, and I should interpret the true meaning of the dots with that bias in my mind. FRANCIS GALTON.

SOCIETIES AND ACADEMIES.

LONDON.

Chemical Society, February 6.—Dr. W. J. Russell, F.R.S., in the chair.—The following papers were read:—Observations on nitrous anhydride and nitric peroxide, by Prof. Ramsay, F.R.S. The author recommends as the best method of preparing pure nitrogen peroxide that the deep blue-green liquid, supposed to be a mixture of this oxide with nitrous anhydride, which is obtained by condensing the products of the interaction of arsenious oxide and nitric acid, be added to a solution of nitric anhydride in nitric and phosphoric acids, prepared by adding phosphoric anhydride to well-cooled nitric acid; after agitating the mixture, the upper layer is decanted and distilled. He assumes that the two oxides interact according to the equation: $N_2O_3 + N_2O_5 = 2N_2O_4$. The melting-point of the peroxide was found to be 10°·14, in agreement with Deville and Troost's statement. The depression of the freezing-point caused by one part of chloroform in 100 parts of the peroxide was 0°·35, and by one part of chlorobenzene 0°·37; the molecular depression is therefore 41°. The heat of fusion, W, of the peroxide, calculated from this number and the observed fusing-point, by Van't Hoff's formula $W = \frac{0{\cdot}02T^2}{t}$, where T is the freezing-point of the solvent in absolute degrees and t the molecular depression, is 33·7 cals.; a direct determination gave 32·3 cals. To determine the molecular weight of nitrous anhydride, a known quantity of nitric oxide was passed into the peroxide, and the depression of the freezing-point determined. Assuming that an amount of nitrous anhydride equivalent to the nitric oxide was formed, the results gave the values of 80·9, 92·7, and 81·0 against 74, the value corresponding with the formula N_2O_3. The author was unsuccessful in freezing nitrous anhydride even at −90° by means of liquefied nitrous oxide. It was found to be soluble in this liquid, and it was further observed that as evaporation took place nitric oxide gas was given off together with the nitrous oxide; it would therefore appear that N_2O_3 is unstable even at the very low temperature at which nitrous oxide is liquid. In the discussion which followed the reading of the paper, Mr. Pickering pointed out, with reference to Prof. Ramsay's determination of the heat of fusion of nitric peroxide, that observations on substances which exercise an appreciable influence on each other cannot safely be used in deducing the heat of fusion. Thus in the case of mixtures of water and sulphuric acid, solutions containing 29·5, 18·5, 8·6, 1·0, and 0·07 per cent. of acid, gave respectively the values 37·4, 58·3, 79·9, 74·9, and 56·3 as the heat of fusion of water, instead of 79·6. In reply to Mr. Wynne, who remarked that nitric oxide alone should interact with nitric anhydride in the way attributed to N_2O_3, Prof. Ramsay stated that he had not examined the action of nitric oxide on nitric anhydride.—Note on the law of the freezing-points of solutions, by Mr. S. U. Pickering.—The action of chromium oxychloride on nitrobenzene, by Messrs. G. G. Henderson and Mr. J. M. Campbell.—Studies on the constitution of the tri-derivatives of naphthalene; No. 1, The constitution of β-naphthol- and β-naphthylaminedisulphonic acids R. and G.; naphthalenemetadisulphonic acid, by Prof. H. E. Armstrong, F.R.S., and Mr. W. P. Wynne. After alluding to the great theoretical importance of a study of the tri-derivatives of naphthalene, the authors draw attention to the necessity of determining the constitution of those tri-derivatives which are employed technically in the manufacture of azo-dyes in order that the dependence of colour and tinctorial properties on structure may be determined; and especially is this the case, since all are not equally valuable—β-naphtholdisulphonic acid G. (Gelb), like Bayer's β-naphtholmonosulphonic acid, interacting but slowly