

provision we see in it for continuous development. The Faculties, the Boards of Studies, the Senate, are all under the scheme subject to provisions for renewing their composition. There will be therefore, we hope, a properly controlled flow of new life through every branch of the governing authority of the University. The present condition of crystalline rigidity will dissolve. As new objects of University enterprise come to the surface and assume definite shape, the men who advocate them will find their way to the Faculties and succeed in making their voices heard. At the same time there is sufficient opportunity for discussion to prevent the University being launched unadvisedly in any rash development.

We do not conceal our own hope that the most important outcome of the new scheme will be the ultimate provision of appliances for the prosecution of the higher studies in London. These never can be self-supporting, and never can, therefore, be properly undertaken by the constituent colleges. This voice of the faculties must be in the long run the voice of the men who compose them. That they will, therefore, if constituted, take some action in the matter, can scarcely be doubted. But instead of individual voices crying in the wilderness, there will be the mature utterances of a responsible body carefully guarding the interests of the constituent colleges on the one hand, and looking to the distinction and influence of the University on the other. Properly considered schemes will be put forward, and whether their execution devolves on the State, or is undertaken by private munificence, the public will for the first time have in the Faculties an authority competent to advise it in such matters, and whom it can listen to with confidence. The ultimate expansion of the University into all that can be desired, appears to us the inevitable outcome of Lord Justice Fry's scheme, if it is carried into effect.

THE WOOL FIBRE

The Structure of the Wool Fibre in its Relation to the Use of Wool for Technical Purposes. By F. H. Bowman, D.Sc., F.R.S.E., F.L.S., &c. (Manchester: Palmer and Howe; London: Simpkin Marshall and Co., 1885.)

THIS is a series of lectures delivered by Dr. Bowman to the students of the Bradford Technical College and the members of the Dyers' and Colourists' Society, and is in continuation of a similar series on the "Cotton Fibre."

The subject is one of so great importance that Dr. Bowman is amply justified in concluding that the information contained in his lectures ought to be accessible to others than students; for, if there is anything to learn with respect to a great national industry like the woollen trade, it is highly desirable that no time should be lost in communicating it to those who are now engaged in the trade, rather than that we should wait half a generation for the knowledge to become available in the hands of the students.

It is no doubt very difficult to introduce new methods and to banish old ones, except by the introduction of young blood; but even so, something may be done in the way of preparing the minds of the older workers to re-

ceive the new ideas of the young ones, and this at least Dr. Bowman's work is likely to do.

Whether Dr. Bowman has been wise in preserving the lectures in their original form in his book we take leave to doubt. It makes the book very much larger than it would otherwise have been, owing to the unnecessary recapitulation at the commencement of each lecture, and not only so, but the labour and attention which would have been required to remodel the lectures would have prevented some glaring errors and defects of style which are by no means creditable to a writer of Dr. Bowman's attainments. A careful perusal of the proof-sheets would surely have removed such errors as "the appearance of the bulbous parts are very similar;" "the Exmoor sheep are the smallest of the two;" and the vulgarism, "some of the sheep in the northern districts have four and even six horns, *the same as* the Iceland sheep."

These literary defects notwithstanding, the book is most opportune and valuable. The key-note of the whole is perhaps to be found in the following sentence:—"All our machines and processes are only a means to an end, and the correct method of proceeding is ever to have the end in view from the beginning. Strange as this may appear, such is not always the case in our manufactures, and especially in those where the materials pass through many hands in different works before reaching the final stage. How often do we find the farmer, for example, quite careless in regard to the nature of the dips, and washes, and smears which he uses for his sheep, in utter forgetfulness of the fact that, although he may gain a temporary advantage, he is spoiling the wool for future use in spinning and dyeing."

Dr. Bowman puts forcibly before his readers the fact that wool is a part of the skin of the animal on which it grows, and is capable of being modified to a very great extent indeed—much more than most people are aware—by change of climate, food, and other surroundings, and especially by judicious breeding. One-sixth of the book is devoted to an enumeration of the various breeds of sheep to be found in the world, for the purpose of illustrating this. Perhaps, if we may be permitted to say so, this division of the work might have been judiciously shortened by the omission of details respecting numerous breeds of sheep which are now of little more than historical importance, especially as Dr. Bowman appears to be of opinion that the course which has been followed is the right one, and that we are now in possession of practically the best breeds of sheep which we could have for wool-producing purposes.

The lectures are five in number, of which the first is chiefly introductory. In it the author discusses the difference in composition and structure of animal and vegetable fibres and minutely describes the structure of cotton, silk, and wool as disclosed by the microscope. He points out the distinction between hair and wool so far as any real difference exists, and describes the constitution of the skin and the mode of production and growth of hair or wool.

The second lecture is chiefly devoted to a description of the various breeds of sheep and of the results of cross-breeding.

In the third lecture the author describes the typical structure of wool fibre under the two heads: (a) in regard

to the mechanical arrangement of its ultimate parts; (*b*) in regard to its chemical composition.

The fourth and fifth lectures deal with, first, the variations from the typical structure found in fibres taken from the same animal and grown at the same time, in fibres from the same animal grown in different years, in fibres from the same animal grown under different climatic and other conditions, and in fibres from different breeds of sheep grown in different countries; and, secondly, the effect of these variations in the manufacturing processes.

There are a number of excellent illustrations which materially assist the reader.

It has hitherto been too commonly supposed that the sheep might be turned out upon our bleak and barren hillsides, of which no other use could be made, and left to its own resources; but this is doubtful economy, even as regards the land, and Dr. Bowman shows that as to the sheep it simply ruins the wool. "The wool and its character depend very largely not only on the health of the sheep, but also upon climatic and other influences. The mildness or severity of the season and the plenty or scarcity of food very largely affect the character of the wool. In very severe seasons there is a tendency to a thickening of the fibres, with greater irregularity in the length of the general staple and a greater rankness of the fleece, with undergrowth of short fibres and a greater irregularity in the diameters of the individual fibres and the different parts of the same fibre. The general character of the wool is also affected because from constant wetting and drying in the bad seasons the wool becomes tender and rotten and loses its brilliancy and lustre." "When examined under the microscope the individual fibres are found to be injured in their structure by the want of proper nourishment and the deficiency in the natural suint or grease, a great part of which is soluble in water, and when removed leaves the fibres dry and hask. Of course amongst well tended flocks these variations are reduced to a minimum, because they are supplied with suitable shelters from the storms and fed artificially when there is a scarcity of pasture." Most farmers think more of the mutton than of the wool, but whatever improves the one improves the other, and it would pay them well to devote more attention to the comforts of our hillside sheep, and even of those which are pastured in more favourable situations.

Great improvements have, we believe, been effected in apparatus for washing wool, but perhaps Dr. Bowman is right in saying that even yet sufficient attention is not paid to the temperature of the water. It seems to be forgotten that wool is an animal matter and that "the real base of the wool fibre is a body which very closely resembles, and is allied to, the albumenoids, and all these bodies are subject to very great changes in molecular condition when subjected even to moderate degrees of heat." Dr. Bowman made a number of experiments with "a bright-haired wool" to determine the effect on its lustre and strength of washing at different temperatures in pure water. He found that "wool which looked quite bright when well washed with tepid water was decidedly duller when kept for some time in water at a temperature of 160° F.; and the same wool, when subjected to boiling water 212° F., became quite dull and lustreless." As Dr.

Bowman elsewhere says, when water is heated by blowing in jets of steam, as is not unusual in wool-washing, the temperature varies in different parts, being nearly or quite 212° close to the steam jet, whilst very much lower at a little distance.

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PHYSIOLOGY OF THE EMBRYO

Specielle Physiologie des Embryo. Untersuchungen über die Lebenserscheinungen vor der Geburt. Von W. Preyer. (Leipzig: Th. Grieben's Verlag, 1885.)

THE vital processes of the embryo present so many difficulties in their investigation that, in spite of their great interest, they have hitherto received only a small share of the physiologist's attention. Prof. Preyer's new book will therefore be received with welcome as an important contribution to our knowledge of the subject; and is likely, on account of its completeness, to become a standard text-book.

The work is an almost exhaustive summary (extending to more than 600 pp. 8vo) of the results of investigations into this branch of physiology from the time of Aristotle downwards. Indeed, so large a proportion of other men's researches are included, that the title "*Untersuchungen* . . . von W. Preyer" would seem to require modification.

The reader may be a little disappointed with the earlier portion of the book, on account of the trite nature of some subjects which could hardly have been omitted; but the matter increases in interest with the progress of the work, and especially where the author's own researches are described. The style is not as condensed as could be wished: but this fault is not uncommon in scientific writings.

Although the common chick most rightly receives a large share of attention, yet other animals—mammalia, reptiles, and fishes—are not in any way neglected, and even invertebrates are occasionally touched upon. The most valuable observations are those on the guinea-pig, dog, &c. The author laments the scarcity of material and of opportunities for observation on the human subject; and recommends that in foundling hospitals and lying-in institutions a supply of apparatus should be kept ready for observing the physiology and pathology of the new-born; since much may be learnt from the phenomena, especially the changes, which occur within the first minutes or hours after birth.

In the first section, which treats of the embryonic circulation, Prof. Preyer shows the probability that in the chick the primitive blood, or hæmolymph, begins to move before the occurrence of the first heart-beat. This he attributes to the effect of heat, the heart occupying a higher position in the embryo than the vessels, so that by convection the blood tends to rise towards the heart and distend it. This explanation is not satisfactory on physical grounds: for it is difficult to realise that there can be a difference of temperature between the contents of a minute vessel and its surroundings sufficient to cause such a movement. Is it not equally probable that the change of specific gravity may be due to chemical changes in the hæmolymph; or, more probable than either, that the fluid is formed in the peripheral vessels and driven onwards by the pressure of osmosis?