

tially or completely neglect the researches by which alone our knowledge of the mechanics of the atmosphere can be increased. In this criticism must be included the United States Weather Bureau (exception being made in favor of Professor Bigelow's discussions), and the similar bureaus of such equally enlightened countries as France and England. However, in the latter country an attempt is now being made to create an Imperial meteorological institute which could undertake the discussion of the great mass of data accumulated in Great Britain and her colonies, especially the relations of solar phenomena to meteorology and magnetism, and it is argued that this would contribute towards the formation of a body of scientific investigators adequate to the needs of the British Empire and be of the highest educational and scientific worth. In the United States, meteorological research has always been fostered by individuals, of whom the names of Franklin, Redfield, Espy, Coffin, Maury, Loomis and Ferrel are brilliant examples. To-day my colleague, M. Teisserenc de Bort in France, and we ourselves at Blue Hill, are endeavoring, unassisted, to solve problems in dynamic meteorology, which ought to be undertaken by the national services of our respective countries. It behooves then those who are desirous of advancing the status of meteorology to strive to convince the public that the function of a government bureau is not merely to collect meteorological data and to make inductive weather predictions based on remembrance of the sequence in similar conditions, but that the science of meteorology requires laborious researches by competent men and the generous expenditure of money before practical benefit can result from improved weather forecasts. If some of my hearers are converted to such an

opinion, this address will have served a useful purpose.

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SCIENTIFIC BOOKS.

The Lymphatics. By POIRIER, CUNÉO and DELAMERE. Translated and edited by CECIL H. LEAF. Chicago, W. T. Keener & Co. 1904.

The chapters on the 'Lymphatic System' in Poirier's 'Anatomy' have been translated into English and presented in book form by C. H. Leaf. The first half of the book is on the 'General Anatomy of the Lymphatics,' and is by Delamere, while the second half is by Poirier and Cunéo and treats of the 'Special Study of the Lymphatics in Different Parts of the Body.' The translation is thoroughly well done.

The increasing interest in the lymphatic system makes the appearance of such a book especially welcome. It is the most complete and comprehensive monograph on the lymphatic system that we have and will fill a long-felt need. It contains some original work, especially the last half. The two parts are distinct and will be taken up separately.

The plan of the first part is excellent, the subject being treated systematically under four heads, the lymph, the leucocytes, the lymphatic vessels and the glands. Each subject is treated first practically, by giving our definite knowledge about it, and then theoretically. The practical part is excellent, clear, comprehensive, definite and not diffuse. It brings together facts for which one would otherwise have to hunt through many books. The treatment of the theoretical part, on the other hand, is weak. For example, under the lymph, its properties, physical and chemical, are unusually well given; but in the treatment of the theories of the formation of lymph it is not clearly brought out that there are two opposing theories; one that physical forces are sufficient to account for the formation of lymph, and the other that it is a secretion of endothelial cells. It is not shown that the physical theory, which has grown out of the

filtration theory of Claude Bernard, involves not only filtration, but osmosis and diffusion. The arguments for the secretion theory are more fully given, but not well analyzed. For example, *Rauvier's* observation that the large sacs, which are so characteristic of developing lymphatic capillaries, are filled with a fluid different from blood plasma is given as evidence that this fluid is the result of secretion, while as a matter of fact it is not an argument for one side more than the other.

The subject of the leucocytes is a difficult one to treat. The descriptions of the different types are excellent, much better than in the average text-book, and can not fail to be helpful to the student. Many special points, familiar to one with experience in blood work, but perplexing to the student, are brought out. For example, the difficulty of drawing a sharp line between the small and large mononuclears. The different solubilities of the granulations is another valuable point. The theory of phagocytosis is so identified with the name of *Metchnikoff* that one is surprised to find but a casual mention of his work in this connection. It also seems a mistake not to mention that in view of the studies on chemiotaxis and immunity our ideas of the physiology of the leucocytes now include much more than phagocytosis.

In regard to the granulations, our author asks of what is the physiological value of distinctions established by color reactions. This point is brought out in a more interesting and fruitful way by *Ehrlich* in his book on 'Die Anaemie,' when he says that only a part and, perhaps, only a small part, of our knowledge of leucocytes can come from histological studies, that we must turn to experimental work and to pathology for a wider knowledge. However, the classification given by our author is based on the granulations and we believe that it is the best classification that we have. No classification can be thoroughly rational until we know the origin of the leucocytes. The grouping given by *Delamere* is certainly practical. He divides the leucocytes into five classes: (1) microcytes (lymphocytes), (2) macrocytes (large mononuclears), (3) cells with neutrophilic granules (poly-

morphonuclears), (4) cells with acidophile granules (eosinophiles), (5) cells with meta-chromatic basophile granules (mastzellen). This is based as much as possible on the granulations, for the macrocyte has basophile granules and the microcyte is without granules. This classification is also best adapted to the study of bone marrow.

In regard to the theories of the formation of the leucocytes the treatment is again weak. The theory that the leucocytes come from the lymph nodes, and the granular forms from the bone marrow, is attributed to *Denys*. This theory our author brushes aside on the ground that the leucocytes are present before the bone marrow is formed. This is of course true, just as much as that lymphocytes occur in the thymus before lymph nodes are formed, and that blood cells occur in the blood islands of the area vasculosa entirely outside the body. This theory, as developed by the *Ehrlich* school, recognizes that there are many places for the development of blood cells in the embryo, but that in the adult the bone marrow gives rise to the granular forms. It can not be considered as proved, but it gives the most fruitful working bases we have at present. It has been built up through a study of the anæmias and leukæmias and it certainly can not be brushed aside without taking into consideration the pathological evidence. It leaves the question of the origin of blood cells from connective tissue open, stating that whether the leucocytes come from preexisting blood cells or from connective tissue cells they are formed in the adult in the lymph nodes and bone marrow. In regard to the origin of the leucocytes from connective tissue our author is dogmatic when he says that it is proved that a leucocyte can become a connective tissue cell, and it is at least very probable that a connective tissue cell can become a white cell. In reality we are waiting for a new way of attacking this problem.

The chapter on the lymphatic vessels is thoroughly interesting and much in advance of the usual text-book, since it is based on the work of *Ranvier*. It has, however, certain mistakes of *Ranvier's*. It is as clear a statement of the subject as could be given without

a knowledge of the true morphology of the lymphatic system. For example, the question of whether the lymphatics have an especial relation to the serous cavities is wholly cleared up on the basis of the lymphatic vessels being modified veins rather than modified tissue spaces. This section has two excellent pictures of lymphatic capillaries—on pages 74 and 76. They are both thoroughly characteristic and hard to reconcile with Sappey's figure of the lymphatic vessels in the skin given in the same section. In regard to the question of open and closed lymphatics our author is again dogmatic, stating that the lymphatic capillaries are invariably absolutely closed. The recent embryological studies agree that the lymphatic capillaries develop as closed ducts; this, however, does not prove that they are always closed, nor closed in all parts of the body. We may admit that openings have not been demonstrated and that lymphatic capillaries can be injected without extravasation, but how do we explain how the granules of coal pigment get from the air sacs of the lung into the lymph nodes. Experimental evidence obtained from injecting granules into the abdominal cavity is certainly against the idea that all of the granules are carried into the lymphatics by leucocytes. In other words, our histology of the lymphatic capillaries is not yet adequate to explain our physiology, and until it is it is safer not to be dogmatic on the subject of open and closed lymphatics.

In connection with the lymph nodes no one has yet given us such clear pictures as His and we can not but think that this chapter would be improved were it based on his work. A good picture of the connective tissue framework of the node would add much to the clearness of the descriptions. The comparison of lymph nodes in different animals is helpful and the chapter contains many suggestive points.

In general, the first part of the book is an excellent compilation of the facts. It gives a complete literature, but in treating of the development of our knowledge of the subject does not bring out which works have marked the important steps in advance.

Though it will be a helpful book to students, it will not do for the lymphatic system what Waldeyer's critical review did for the nervous system, that is, give an even clearer picture of the subject than could be obtained from reading original literature.

The last of the book on 'Regional Anatomy' is a higher type. Though based on the work of Sappey it is not a compilation, but presents a number of new and valuable figures. The subject is treated under the following heads: (1) The lymphatics of the lower limb, (2) of the pelvis and abdomen, (3) of the thorax, (4) of the upper limb, (5) of the head and neck, and finally (6) the collecting trunks. The body is thus gone over systematically and numerous points noted where our knowledge is quite inadequate. The subject of absorption from the central nervous system is untouched. This part of the book is not only helpful to the student in giving what is already known, but will form a good starting point for further investigations.

In general the book will give any one who does not have access to the original literature on the subject, to the works of Sappey, Ranvier, His, Fleming and von Recklinhauser an excellent presentation of the subject.

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The Teaching of Biology in the Secondary School. By FRANCIS E. LLOYD, A.M., and MAURICE A. BIGELOW, Ph.D., Professors in Teachers College, Columbia University. American Teachers Series. New York, Longmans, Green and Co. 1904. Pp. viii + 491.

Of this book it may certainly be said that it is by the two men who, of all in this country, are best fitted by their official positions and the nature of their work to write it, for the Teachers College is the one educational institution which lays equal stress upon content and upon method. There will be, I believe, no dissent from the opinion that it justifies our expectations. Its title is not precisely descriptive, since it is not one book, but two separate works by different authors devoted to the teaching of botany and zoology respectively. Yet their union here is amply