

Dairy Science.*

MILK is the most important food of man and beast and in the early stages of their life, offers the only source of nutriment ensuring steady maintenance and growth, building up immunity against disease and laying the foundations of the future health of the individual. The constituents of milk, proteins, sugars, fats, pigments and minerals are so well-proportioned as to render this product one of the most easily digestible and highly assimilable of all foods. These unique properties and its indispensability in the nutrition of animals, have been responsible for stimulating a vast amount of research on the physical, colloidal, chemical, bacteriological and nutritional aspects of milk.

The recent publication entitled *Fundamentals of Dairy Science*, is devoted to a discussion of these fundamental questions and provides detailed and authoritative information on these various aspects from a purely scientific point of view.

The first five chapters deal with the chemical composition of milk and milk products, and proteins, fat and carbohydrates comprising the essential constituents of milk. An entire chapter has been devoted to an able review on the pigments of milk which have assumed great importance in relation to vitamins and respiratory enzymes.

Milk furnishes one of the finest examples of a typical and perhaps a comprehensive colloid, several phases of varying degrees of dispersion, participating in the system. A beautiful discussion of this colloidal aspect is to be found in the chapter on the physical equilibria of milk. The sizes of particles which were wrongly expressed in the previous edition have now been corrected and the conventional and generally accepted unit, $m\mu$, adopted.

Many of the physical and chemical properties of milk, which are of great importance from an industrial point of view, have been discussed in relation to certain processes in the dairy industry. The creaming ability of milk has been correlated with the state of aggregation of the fat globules and the effect of several industrial treatments like pasteurisation, homogenisation, etc., on creaming has been discussed from the fundamental standpoint. In a similar manner, the quality of foaming, cream-whipping and

coagulation in relation to cheese manufacture, which is one of the most important of dairy industries, have been treated.

Milk is an excellent culture medium for the growth of various types of micro-organisms including many bacteria pathogenic to man, and the large-scale production, handling and transportation of such a product, therefore, present problems in pasteurisation, maintenance of sterility etc., involving a rigorous bacteriological control, which is facilitated by a close understanding of the ecology of the bacterial associates, their multiplication and growth in relation to the physical and chemical properties of milk. These problems are presented in the series of chapters devoted to a discussion of the microbiology of milk and milk products.

The last two chapters provide information of great interest not only to the physiological chemist but also to the general reader. The nutritional value of milk in the early and later stages of the life of an animal, is discussed in relation to other sources of nutriment. Attention is drawn to the incidence of nutritional anæmia due to the low content of iron and copper in milk, constituents found essential for the regeneration of hæmoglobin. Vitamin constituents of milk in relation to breeds and feeds are discussed.

The rôle of colostrum in the nutrition and immunisation of infants and young ones has been the subject of controversy and a useful discussion of this vital subject which is presented in the volume is helpful to those investigators interested in this aspect of milk nutrition.

Most of the valuable information contained in the volume relates naturally to cow's milk which is the most important dairy animal in the world; but there are other animals like the buffalo and the goat which are the main, if not exclusive, sources of milk to certain races and communities. Buffalo's milk in particular deserves a more detailed treatment since it is often a more economical dairy animal yielding a richer quality and larger quantity of milk. Data giving a comparative idea of the nutritive values of milks from various milch animals would form a most useful addition to this chapter on the nutritional value of milk.

This monograph is perhaps the only treatise in the English language which deals in a comprehensive manner with the several aspects of dairy science. It is a volume

* *Fundamentals of Dairy Science*, by Associates of
ore A. Rogers, Reinhold Publishing Corporation,
New York, Second Edition, 1935, pp. 616, \$ 6.

which will be gratefully welcomed not only by a number of specialist investigators, the colloid chemist, the biochemist, the physiologist and the bacteriologist, but also by dairy technologists, physicians and food-

chemists, interested in the relation of milk to public health and nutrition.

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The Arachnida.*

SINCE Warburton's article in the *Cambridge Natural History* which appeared as far back as in 1909, no complete account of Arachnida in the English language existed and the present monograph fills a gap in our knowledge of Arthropods.

In the prolegomena considerations like the general characteristics, habits and behaviour and the evolution and classification of the class have been dealt with. Our knowledge regarding many of these problems is by no means complete, but the author, including most of the recent literature on the subject, has made it as up-to-date as possible. Buxton's extensive researches on the coxal glands of arachnids and Millot's investigations into the anatomy and physiology of many arachnids have been incorporated. A consideration of the evolution of the class is not a matter of ease. Conflicting theories like those of Ray Lankester and Pocock, of Zittel and of Leukart, Hansen and Sorensen have made the problem a very difficult tangle from which only a few very clear features emerge. The Trilobita, the Eurypterida and *Limulus* centre round this problem, and the question ultimately resolves itself to a matter of assigning importance to the fossil remains of the Eurypterida and the Trilobita, and the few forms that stand intermediate between these and *Limulus*. It need hardly be emphasised that the ancestry of arachnids is closely bound up with the question of the primitive habitat of arachnids and there is no doubt that, should the theory of Leukart, Hansen and Sorensen come to be accepted, there should have to be a complete change in the interpretation of the diverse characters presented by the arachnids. But it is more likely that, if there is one group of animals that will shed more light on this vexed question, it is the Onychophora.

Nor has the classification of the Arachnida

been free from changes and this is mainly due to the indiscriminate distribution of many anatomical features among the different orders. The Arachnida, therefore, cannot be divided into orders which can be arranged in an ascending series. A number of schemes of classification have been examined by the author who finally adopts Pocock's scheme, with this alteration, that he excludes the Trilobita from the Arachnida on the ground that they are primitive Crustacea.

The Xiphosura has been treated with a thoroughness which it richly deserves. The only group of primitive arachnids which is surviving to this day, it also includes the only marine forms. A chapter is devoted to each of the other orders, whose anatomy, distribution, classification and diagnostic features are described. Of these the *Reclinulei* stand out with great prominence. This group of arachnids whose rarity is great and whose importance is hardly less, seems to be the only one where the animals possess no type of sense organ and carry their genitalia in their tarsi. Only 32 living specimens are known and as the author says "the future of this group may well hold surprises in store".

Two chapters are devoted to extinct arachnids, of which the Eurypterida are the most important. The position of the Trilobita is also discussed, the author being definitely of opinion that they are primitive Crustacea.

Our knowledge of the Pycnogonida, Tardigrada and Linguatulida has not advanced further after the article by Warburton in the *Cambridge Natural History* and even in 1935 the author of a treatise on Arachnida has to treat them as "doubtful arachnids". The Tardigrada have the least justification for inclusion amongst the arachnids.

But for Mr. Savory's long chapter on economic arachnology, one would have thought that these animals were of no economic importance. He has given a variety of ways in which the Arachnida influence the lives of men. The ticks and mites, the spiders

* *The Arachnida*. By Theodore H. Savory. Pp. xi+218, 8 Plates. (London: Edward Arnold & Co. 1935.) 25 sh. net.