afferent fibers located principally in the intestinal tract. Dr. Wang in his laboratory has contributed enormously to our understanding of motion sickness, radiation-induced vomiting, and drug-induced vomiting of various sorts. Furthermore he and his collaborators have studied the effects of a great number of antiemetic agents on vomiting induced by various mechanisms. Probably half of what we know of central emetic mechanisms is the product of this one laboratory.

It is not obvious why relatively few laboratories have been interested in these subjects, since they are of both practical importance and intellectual interest. In any case this factor makes the contribution from this laboratory more impressive.

This book is a gold mine of information on the brain stem systems controlling autonomic functions. Although Dr. Wang and his collaborators have made major contributions, other studies are appropriately referenced. Both a sense of history and a consistency are portrayed in this book - a view of an investigator whose goal had its conception in China in the mid-1930s and who never lost sight of this goal throughout a long and productive career. In addition to being an invaluable source of information on brain stem physiology and pharmacology of autonomic function, this book shows the enthusiasm, motivation, and brilliance of a dedicated scientist in a continual search for the mechanisms underlying these fundamental processes.

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Digestive Physiology and Metabolism in Ruminants. Y. Ruckebusch and P. Thivend, Eds. AVI Publ. Co., Westport, CT, 1980. 900 pp., illus., index, $54.00.

Every five years, a new scientific committee in a different part of the world organizes an international conference on the physiology and metabolism of the sheep and ox. This book consists of the papers invited by a European panel, and presented in September, 1979 at Clermont-Ferrand in the Auvergne. The volume represents compulsory, at times compulsive reading, not only for those directly engaged in the field, but also for many animal scientists who are employed in practical problems of nutrition and production. Rather than preach to the converted, for this review I shall select those parts which might appeal to non-ruminant physiologists.

The comparative gastro-intestinal physiologist is particularly well served. One review relates the gut anatomy and physiology in wild ruminants to their feeding habits, differentiating the grazers from the browsers. Another compares the ability of different desert ruminants to store water in the digestive tract. In two of the articles on microbial digestion, one speculates on evolution of this mode of mammalian alimentation, whereas the other compares the physiology of herbivores specializing in fermentation in the foregut with those that specialized in hindgut fermentation. An exhaustive article describes both the external cycling of digesta by coprophagy and the internal reflux in many non-ruminant species including birds, rodents and carnivores. The review of the control of emptying of the abomasum, the glandular compartment of the stomach, and the chapter on the mechanical and electrical events in the abomasum and small intestine contain much of comparative interest.

Intermediary metabolism, especially as it relates to nutrition and meat, milk and wool production, has always been prominent in ruminant studies. Contributions of general interest include one on hormonal control of amino acid metabolism during growth, and another on the turnover of adipose tissue lipids, with emphasis on the accretion and mobilization of fat. Two chapters are concerned with how the host utilizes the products of fermentation, one on propionate and vitamin B12 and their interrelation, the other comparing the metabolism of D-lactate, which originates solely from microbial activity, with that of L-lactate. One nutritional problem posed at the beginning of this century, namely that of the origin of the heat increment of feeding in the ruminant, still awaits a complete solution.

In the section on behavioral physiology and nutrition, the peripheral metabolites in the portal drainage which initiate and suppress the act of eating are related to energy balance. A second paper discusses the importance of central nervous control of the intake of water and salt, for which the goat has proven such a useful experimental animal.

Ecological interests are served at the microbiological level by discussing the mutual interaction of species of rumen microorganism with reference to their competition for substrate and the effects of their metabolic products. Simple models relate the growth and dilution rates to the stability of the populations. At the other extreme is a wide ranging review of the role of herbivores in agricultural ecosystems.

An interesting and delightfully written account brings the historical background to digestive studies up to about fifty years ago. The preface contains a fine appreciation of the late Andrew T. Phillipson. His work, started forty years ago and still largely unrecognized outside the discipline, played a major role in furthering the understanding of the physiology of the ruminant.

From the more specialized articles, I would draw attention to one differentiating the bacterial population adhering to the wall of the rumen from those in different phases of the ingesta, and to another describing the physiological changes brought about by infestations of gut parasites. Some two fifths of the papers, mainly those relating to ruminant digestion and digestive adaptation have escaped mention in this review, and are left for the specialists.

The overall impression is of a well edited, worthy successor to the previously published volumes from these conferences. I am disappointed to note a reduction in basic physiology compared to its predecessors. This probably reflects the increasing difficulty throughout the world in funding fundamental research whose practical application is not immediate.

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