Studies on the Anatomy and Function of Bone and Joints. Edited by F. Gaynor EVANS. 10×6½ in. Pp. viii+155, with 92 figures, with 8 in colour, and some tables. 1966. Berlin, Heidelberg and New York: Springer-Verlag. Price DM 48.

This volume contains ten papers presented at a symposium of the VIII International Congress of anatomists in Wiesbaden in August 1965. The volume as a whole is similar, both in scope and composition, to the previous work on this subject edited by Gaynor Evans and published in 1961, *Biomechanical Studies of the Musculo-Skeletal System*.

Three papers are concerned with aspects of the structure of bones and joints: a study of the electron microscopy of normal synovial membrane, by Davies and Palfrey; a longitudinal vital staining method for the study of apposition in bone, by Baer and Ackerman; and an evaluation of the use of bone histology in forensic medicine and anthropology, by Enlow. Of these, the first is of greatest interest to orthopaedic surgeons. Davies and Palfrey show that the cells lining the synovial surface are widely separated, that they are not arranged on a basement membrane, and that the material between them is of an amorphous and at present chemically unknown nature. This contrasts with the view, commonly held at student level, that the synovial surface is formed by a continuous pavement of cells arranged in a fashion analogous to the endothelium of the gut.

The remaining papers deal with some aspect of the function of the locomotor system. Three of these are particularly valuable, containing excellent reviews of the literature and a description of the author's experimental work. The study of the biomechanics and functional adaption of tendons and joint ligaments by Viidik represents the most complete description of the mechanical properties of tendon and ligament at present available in the literature. The bibliography is extensive and Viidik's own experimental work is excellent. Viidik confirms the findings of most other investigators in this field, that the weakest point in a bone/ligament/bone or muscle/tendon/bone system is the attachment of the ligament or tendon to the bone. Interestingly he advances evidence to suggest that although this point in the link remains the weakest, its strength increases a little when the animal is trained. Of more fundamental importance to an understanding of the tensile properties of collagenous structures is his demonstration of differences between the first and subsequent loading cycles, a difference which is particularly noticeable when creep is considered. Viidik was unable to suggest what structural events underlay this phenomenon, but he points out that it supports the concept that something occurs during the first testing cycle that profoundly affects collagenous structures.

In a second paper Rydell reports intravital measurements of forces acting on the hip joint. Rydell's work has already been published elsewhere, but this shortened version of his full monograph is complete in itself and contains the essence of the information contained in his thesis. Rydell reports his findings in two patients in whom strain-gauged prostheses of the Austin Moore type were inserted following fractures of the femoral neck. He was able to show that the load sustained by the head of the prosthesis (and hence by inference by the head of the femur) rose in quiet walking to a maximum of approximately two and a half times the body weight, whilst during running the forces rose to a maximum of five times the body weight. An interesting additional finding from the point of view of the magnitude of the loads encountered by these prostheses was that, both in walking and running, they fell to zero only very briefly during the swing phase. Rydell was also able to determine the direction of the resultant of these forces: this falls within a small area of the prosthesis located just antero-medial to the zenith of the head. Rydell measured the coefficient of friction between the acetabulum and the prosthesis and found this to be surprisingly low (varying between 0.021 to 0.045, as against approximately 0.009 to 0.015 in normal synovial joints). The information contained in this study is vital to the design of prosthetic replacements for the hip, and forms one component of the basic information which is required for an understanding of the functioning of the normal and diseased joint.

Ascenzi, Bonucci and Checcucci report a study of the tensile properties of single osteons using a microwave extensimeter. This is a beautiful experimental study of the mechanical properties of what is probably the ultimate functional unit of bone. Information of this kind has not previously been available, and the experimental methodology represents a spectacular technical achievement.

Two other papers contain original observations which are of interest orthopaedically: those of Lissner and Roberts on skeletal impacts of human cadavers and of Evans and Bang on the physical and histological differences between human fibular and femoral compact bone. MacConaill provides a discussion of ergonomic aspects of articular mechanics and Zarek discusses some of the theoretical aspects of load carriage in bone and cartilage.

This volume, like its predecessor, represents a very valuable contribution for all those interested in the structure and function of the musculo-skeletal system. It is very much to be hoped that Evans will continue to produce comparable collections of papers from workers in this field in the future. He is to be congratulated on the choice of subjects and on the quality of the editorial work involved.—
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