THE CHEMICAL DYNAMICS OF BONE MINERAL. By William F. NEUMAN and Margaret W. NEUMAN. $9\frac{1}{2} \times 5\frac{1}{2}$ in. Pp. xi+209, with 51 figures and 24 tables. Index. 1958. Chicago: The University of Chicago Press. London: Cambridge University Press. Price 37s. 6d.

One's grasp of any scientific problem usually depends directly upon how well one knows the literature. This unfortunately has not been my experience in the field of bone biochemistry. The more I read, the more I became involved in a mass of conflicting and unrelated details, and I am sure that others must have felt themselves in the same situation. This short, well produced monograph by William and Margaret Neuman will help to rescue many of us from our difficulties. It is the most lucid and coherent account of the chemistry and biochemistry of bone that I have ever read. It is also a highly courageous and original contribution—much more than a review and rehash of existing information and hypotheses.

Studies *in vitro* using synthetic hydroxyapatite or bone mineral have allowed an analysis of the exchange of ions between the crystals and surrounding fluid media. The amounts of calcium and phosphate in a fluid similar in composition to extracellular fluid are such that it is supersaturated when in the presence of bone mineral. In the absence of the solid phase, however, such a solution is stable and apatite crystals can be formed only with the help of a seeding mechanism. In the presence of the solid phase, the degree of supersaturation of the fluid can be greatly reduced by various specific ions (notably citrate), so that a close approach to chemical equilibrium is allowed. *In vivo* the skeleton is in biochemical equilibrium with extracellular fluid. There is good evidence that this equilibrium is achieved and regulated by a mechanism depending on the local production of a specific ion, citrate, by bone cells—a mechanism that is sensitive both to parathormone and to vitamin D.

Such in brief is the authors' thesis, and it is very convincingly argued. The chemical foundation has been well laid, but the authors themselves admit ruefully that "in the final phases of construction there was a shortage of good building material—established experimental results." Much more biochemical work is required, but it is clear in what direction the evidence should be sought. The trick in research lies in asking the right questions, and this book should help many workers to formulate these more clearly.—P. G. WALKER.

QUANTITATIVE ROENTGENOLOGIC STUDIES ON CHANGES IN MINERAL CONTENT OF BONE *IN VIVO*. By Karl-Åke OMNELL. $9\frac{1}{2} \times 7$ in. Pp. 86, with 12 figures, 16 diagrams and 11 tables. 1957. Stockholm: Acta Radiologica, Supplementum 148. Price 35s.

The usual method of assessing changes in bone calcification *in vivo* is by subjective observation of successive radiographs, and the idea of making this method objective and quantitative is naturally attractive. Unfortunately, the hopes raised by the title of this thesis are not entirely fulfilled, although some meticulously careful experimentation is described.

The first half of the thesis is devoted to an elementary account of the attenuation of x-rays by matter with particular reference to soft tissues and bone, which can be represented physically by water and hydroxyapatite respectively. Simple formulae are derived whereby, given appropriate physical conditions, the amount of bone salt traversed by an x-ray beam can be determined in terms of the equivalent amount of aluminium, which is used as a standard absorbing material. At this stage the author might be criticised for the implied assumption that an ordinary heterogeneous x-ray beam can be represented by a unique mass absorption coefficient, an assumption which, to say the least, is naïve. At the end of some forty pages the somewhat obvious conclusion is reached that the elegant methods of bone salt assay outlined in the theory are quite impracticable in normal radiographic practice. There is, indeed, throughout the report, an irritating tendency to stress the obvious and to over-elaborate descriptive detail.

For the remainder of the thesis the sights are lowered considerably. Although absolute assay of bone salt *in vivo* is impracticable, it is shown that changes in bone density in one particular region can be followed semi-quantitatively by a careful photometric study of serial radiographs taken under exactly controlled geometrical conditions. This is demonstrated by a limited series of experiments on dogs in which either decalcification of the interalveolar bone septum is induced by amalgam filling of neighbouring teeth or recalcification of the septum is observed after injury by burring. The experiments are described in very great detail and all possible sources of error have been studied. Results, shown in a series of curves, indicate that, given sufficient attention to the physical problems involved, an objective assessment of bone density changes is possible. It would be wrong, however, to imagine that this technique has reached a stage where it could be applied to routine radiological and surgical practice.—J. E. ROBERTS.