that had been assembled within the CHR to locate and maintain contact with the living radium subjects. As a consequence, most of the records of the surviving cases were transferred to the CHR during the early 1970s, and all were eventually received. Only when some of the women to whom Miller had written brought to the CHR his letters asking them not to cooperate did his attempt to prevent the radium cases from being included in the CHR files come to light.

While these problems were being solved, some very significant scientific work was underway within the program. In 1968 the International Commission on Radiological Protection (ICRP) set up a task group to provide quantitative information on the distribution of radioactive materials in bone. John Marshall of the CHR was asked to head this group, which took its charge to include the alkaline earth elements and addressed calcium, strontium, barium, and radium and considered the known data on both bone and soft-tissue retention of the radioelements of these elements in man. The group's work was first published as a research report (Marshall et al. 1973) and subsequently as a report from the ICRP (1973).

The task group derived a whole-body retention function of the form

$$R = (1 - p)e^{-mt} + p\varepsilon^{b}(t + \varepsilon)^{-b}\,[be^{-r\lambda t} + (1 - b)e^{-\sigma r\lambda t}], \qquad (1)$$

where R is the fraction of the injected activity in the whole body after a single intravenous injection at time t, in days. The values of several of the remaining parameters depend on the radioisotope in question. In the discussion that follows, this retention function for radium is referred to as the *ICRP 20 retention function.*

This combination of an exponential term and a power function has similarities to the simple function of Norris et al. (1955), but it contains important metabolic parameters that the Norris function does not. For example, λ is the rate of apposition and resorption of compact bone, and σ is the ratio of the turnover rates in cancellous and compact bone. Thus, the ICRP 20 retention function accounts for the turnover of various portions of the bone itself within the skeleton in its prediction of retention of an isotope as a function of time. This function has become the standard for any discussion of the retention of the alkaline earth radioelements in bone.

Significant improvements were later made to the ICRP 20 retention function. Schlenker et al. (1982), after an examination of data on the distribution of radium in soft tissue, found that the ICRP 20 function did not describe the actual distribution of radium between soft tissues and bone in the human body. They modified the values of certain parameters in the equation