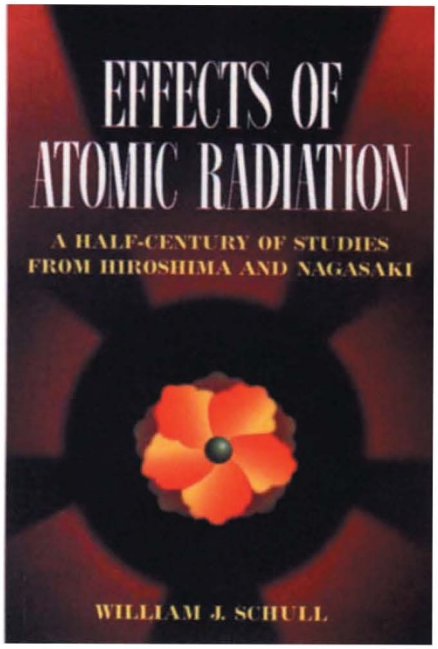

Effects of Atomic Radiation

A HALF-CENTURY OF STUDIES FROM HIROSHIMA AND NAGASAKI

by William J. Schull

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This book has very ambitious but diverse goals. It attempts to review, in some detail the studies of atomic bomb survivors and their offspring following the detonations at Hiroshima and Nagasaki. It also provides a history of the undertaking of studies, including the political issues between the Japanese and American governments and among the sequential organizations given the task of determining the effects of the radiation exposure on survivors. The author provides additional information concerning the magnitude and diversity of the medical consequences of radiation. The factors that limit the power of the epidemiological observations as well as the qualifiers in determining absorbed dose provide a context for assessing the degree of uncertainty of the quantitative relationships derived. Dr Schull is eminently well qualified to offer this review, having been involved with these studies since 1949. Unfortunately, the author tries to make the book accessible to all audiences, lay and scientific, sophisticated as well as naive. Although this broad reach may be laudable, it greatly limits the success of the book. I found some of the discussions pertinent to radiation scientists, others pertinent to general physicians and some of the material and level of discussion most appropriate for a lay audience. Similarly, the names and descriptions of the individual Japanese and American physicians and scientists, involved in these studies may be of interest to those working in this or closely related fields but the general reader will gain little from it and may find it a tedious distraction. The book has numerous digressions intended to explain techniques and radiation-related units and to provide general background for different areas of science. For example, there is a lengthy discussion of development of the central nervous system and another of electrophoresis including Tiselius, the inventor of the technique.

The book begins with historical and political perspectives. Described are the initial attempts to assess the damage and from this to locate the epicenter of the explosions in order to calculate dose estimates. The formation of the Atomic Bomb Casualty Commission is described and its operations explained. The third chapter describes the initial studies and data collection during the first decade. The remainder of the book presents currently accepted results: research strategy, radiation exposure and resultant dose estimates, and the consequences of the radiation on the survivors, the prenatally exposed survivors and the children of survivors. After a brief summary of the results, the last chapter describes general concerns with risk estimates of low doses and the limitations in the power of these studies, because the number of people exposed to significant doses is relatively small. Incorporated into these considerations are other studies of dose and dose rate.

The differences between the uranium bomb dropped at Hiroshima (Little Boy) and the plutonium bomb dropped at Nagasaki (Fat Man) create problems in estimation of exposure and absorbed dose. Schull presents the assumptions that are made in determining gamma and neutron exposure as well as in assigning a value for the relative biological effectiveness of the neutrons delivered. These detailed descriptions will be useful to some; however for most readers they will be excessive, whereas for the *cognoscenti* they will be inadequate.

The major causes of death were the blast and fire; radiation was responsible for about one-third of the early fatalities. But this book is about the consequences of atomic radiation for the survivors. Its importance lies in understanding these studies because they represent most of human experience with significant radiation exposure.

This idea that we must learn all we can from the experience of the survivors, which we all fervently hope will never be repeated, underlies the formation of the Atomic Bomb Casualty Commission and its successor organization, the Radiation Effects Research Foundation. The data produced by these organizations, combined with other experiences and studies of radiation exposure must inform public policy as to how we are to use and not use ionizing radiation. In this book, the results from other pertinent experiences are incomplete or fragmentary.

There are extensive discussions of leukaemia and various solid tumours and their relation to dose in the survivors, with both the absolute and relative risk. The evidence for radiation as an aetiologic agent is made clear, and the magnitude of the effect is compared with the expected incidence, tempered by mention of the absolute number of radiation-related cases seen. *In utero* exposure produced mental retardation, the incidence of which was dose related.

Intelligence was also studied with there being a suggestions of this being related to the dose received during the 8-15 weeks of gestation. To explain these effects, the tests used are described in the context of a general review of the development of the nervous system. The importance of the time in development that radiation exposure occurred is emphasized and suggested as an explanation for the lack of many other defects.

I found this book interesting and a useful source of information but was frustrated by the digressions on the one hand and the brevity of some of the discussion on the other. As a radiation scientist, my concerns may be different from those of others who may find the book suited to their needs. It surely is a useful repository of the medical effects seen and history of the studies of the atomic bomb survivors.