

RADIATION AND HEALTH



William Valentine Mayneord

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The Rock Carling Fellowship was founded as an annual memorial to the late Sir Ernest Rock Carling, for many years a Governing Trustee of the Nuffield Provincial Hospitals Trust and Chairman of the Trust's Medical Advisory Committee. Each holder of the fellowship will seek to review in a monograph the state of knowledge and activity in one of the fields in which Sir Ernest had been particularly interested and which is within the purposes of the Trust. The arrangements provide that the monograph will be introduced by a public lecture to be given at a recognized medical teaching centre in the United Kingdom.



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INTRODUCTION

In the first Rock Carling Monograph ⁽¹⁾ Sir John Charles noted Bentham's use of the term 'mesology' and its related 'social mesology' as being the discipline concerned with the effects upon human beings as individuals or in society of temperature, light, humidity, gravity, atmospheric pressure, meteorology and electrical influences, food and drink, urbanization, sanitary conditions, occupation, domesticity, religion, institutions, laws and psychological factors.

My task, it seems, is to add 'ionizing radiation' to this formidable catalogue and so define the science of 'radio-mesology', snatching the word from the mouths of those who concern themselves with the social consequences of the British Broadcasting Corporation. It is to be noted that Bertillon, who in 1873 rescued the term 'mesology' from oblivion, maintained that there are only two possible ways of modifying man either individually or in the mass. We must either modify his ancestry (clearly possible so far as future generations are concerned) or his natural and social environment.

This distinction neatly sketches the main divisions of radiomesology and even provides appropriate pigeonholes for natural and artificial radioactivity. We observe at once that the study of the effects of radiation on man is part of an immensely wider sociological survey. We guess that our study of radiation and health is likely to show close analogy with that of many other physical factors considered in the same context and is not lightly to be regarded as a thing

sui generis. The number of ways in which a living organism can react to a stimulus is smaller than the variety of stimuli to which it may be exposed.

We are concerned with 'Radiation and Health' and doubtless a logical discussion would commence with a definition of both. By radiation we shall mean only 'ionizing radiation', rather reluctantly omitting sunlight and near visible radiation and confining ourselves to X and gamma rays, as well as corpuscular radiations of high energy such as alpha and beta particles and neutrons. All these entities convey energy to living tissues upon which they fall and in which they are absorbed, thus bringing about physical and chemical changes. These changes, often following complex metabolic paths, sometimes express themselves as biological alterations of medical significance. This, then, is the fundamental rôle of radiation in our context and radiation might be defined in these terms.

But who shall define 'Health'? Do we insist upon the perfect equilibrium and perfect harmony in the individual postulated by Galen and to be attained only in rare moments of life, or be content with a mere absence of clinically detected disease? Shall we take as our basic unit a complete human population, a whole man, a single somatic or germ cell, a chromosome or a gene? Many people now speak of 'Health' as a definable and measurable quantity, characteristically expressing it in a negative way via mortality or morbidity statistics of populations. Yet it is obvious that the patterns of life throughout the world vary so much that no single standard can be set for all peoples, nor even for the same people at different times. Moreover, health status has to be looked at from a community as well as from

a personal point of view and social well-being may be regarded as a predisposing condition of individual health. In the search for quantitative criteria many 'health indicators' ⁽²⁾ have been suggested, often classified into three groups: (a) those associated with the health status of persons or populations in a given area, for example, vital statistics, proportional mortality ratio, life expectation, nutrition, infant mortality, deaths from communicable diseases, and many others; (b) those related to physical environmental conditions having a more or less direct bearing on the health status of the population in the area under review, for example percentage of the population receiving protected water supply; and (c) those concerned with health-service activities directed to improvement of health conditions, for example the availability and use of hospitals. From our point of view obviously none of these criteria is satisfactory, though the exercise may lead to the writing down of a statistic somehow related to 'Health'. Quantitative data concerning the effects of atomic energy and radiations on the well-being of a community are necessarily largely lacking, but this question of defining health, or rather selecting an arbitrary indicator of so-called health and trying to correlate it with radiation, is of fundamental importance to our subject. We may doubt with Alice 'whether you *can* make words mean so many different things', but like the scornful Humpty Dumpty we pay them extra and show which is Master. Nowadays we extend our patronage to numbers too and this perhaps is even more dangerous.

We have later attempted a balance of 'good' and 'bad' effects of radiation in our society and there is a great

temptation to use impressive numerical data as valid criteria to justify our opinions, but it is well to remember the crudity of such concepts of health and well-being before becoming too enmeshed in them.

As a physicist I naturally believe that to be 'numerate' is as important as to be 'literate', but some years of experience in medical physics have taught me that part of the pleasurable impact of numerical data may arise from the power of a number to obscure uncomfortable uncertainty as to what we are talking about.

No subject has at once suffered or gained more from the glare of world publicity than the study of radiation and health. Insistent daily demands for immediate answers leave scientists little time for balanced judgements and well-informed replies, yet had public pressure not been so great, would resources for research and observation have been so profusely forthcoming? If we have sometimes been forced to appear more dogmatic and certain in our opinions than our scientific consciences approved of, at least we stood more chance of having the resources to improve those opinions. We have, too, suffered great changes in climate of opinion. Fifty years ago Radium was the wondrous substance leading to the elimination of disease, the discovery of the 'Essence of Life' and perhaps to a life of ease and happiness to all mankind. Today it is a dangerous substance, the least quantity of which is furtively contained in thick lead caskets and handled with the utmost caution. We must take account of such changing opinions, hoping to be forgiven if we adopt like the doctor described by Rock Carling⁽³⁾ 'a mood of diffident scepticism which long experience of changing medical opinion and belief has

taught us'. Remembering, too, with Lecky that the success of an opinion depends 'much less upon the force of its arguments, or upon the ability of its advocates, than upon the predisposition of society to receive it'.



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