in glasshouse tomatoes is common, and preliminary results indicate that foliar sprays containing magnesium are more effective than soil treatments in maintaining normal leaf colour. The plant-breeding programme is concerned mainly with improvements of tomato, cucumber and lettuce.

The investigations on *Didymella* stem rot of tomato have been continued by the Plant Pathology Department, which is also concerned with powdery mildew of cucumber and wilt disease of carnation as well as mushroom diseases. Some experiments were carried out on chemotherapeutic control of tobacco mosaic virus in the tomato, but it was concluded that this approach is not promising. Although insecticides properly applied should give adequate control of white fly, there are sometimes risks of chemical injury to plants, and for this reason interest has been revived in the method of biological control by wasp parasites. The Entomology Department has begun a series of studies on the effects of environmental factors on the fecundity and development of white fly and on the host/parasite balance. Other investigations by this Department include mushroom pests and the red spider mite. The Crop Protection Department is concerned with the control of mildew of chrysanthemums and aphids on lettuce and with the residual toxicity of certain sprays.

E. C. Humphries

RADIOLOGICAL HAZARDS TO PATIENTS

At the end of 1956, the Secretary of State for Scotland and the Minister of Health appointed a committee "to review the present practice in diagnostic radiology and the use of radiotherapy in non-malignant conditions, having regard to the report of the Committee on the Hazards to Man of Nuclear and Allied Radiations".

This committee, under the chairmanship of Lord Adrian, has now produced an interim report (Ministry of Health; Department of Health for Scotland. Radiological Hazards to Patients: Interim Report of the Committee. Pp. 22. London: H.M. Stationery Office, 1959. 1*s*. 3*d*. net) for the one completed part of its survey, namely, the use of X-rays for mass miniature radiography. The conclusion is drawn that, when properly conducted, examinations by this method make a negligible contribution to the total radiation to which the population is daily exposed. Even on the most pessimistic assumptions, the indefinite continuation of mass miniature radiography at the present rate could add no more than 20 cases of leukæmia to the annual incidence of 2,500 cases in Great Britain; it is also possible that it would produce no additional cases at all. The gonad doses, which determine the long-range genetical damage, have been found to be even smaller than previously estimated. These very small somatic and genetical risks have to be considered in relation to the undoubtedly large benefits of mass miniature radiography to the health of the population. In 1957, these examinations led to the discovery of nearly 18,000 cases of pulmonary tuberculosis and some 63,000 other abnormalities, which included lung cancer, heart disease and pneumoconiosis. For children and pregnant women, mass miniature radiography is not recommended and should be replaced by normal radiographic procedures with strict limitation of the field to the chest. Some general principles are also given for reducing unnecessary exposure in other forms of diagnostic radiology, in particular fluoroscopy; but the survey of this area is not yet completed.

There is one statement in the introduction (paragraph 10) which may give rise to serious misunderstandings. It is stated, correctly, that a dose of radiation which would double the present mutation-rate would cause perceptible damage to the population, and that this dose is estimated to lie between 10 and 100 r. per generation. It is also correct to say that at present the dose due to medical radiology does not exceed 3 rads per generation. But it is only for the sake of convenience that genetical damage is usually estimated in terms of the 'doubling dose'. There is no lower threshold to the genetical effects of ionizing radiation, and serious genetical damage will be produced already by doses which are far below the doubling dose. In fact, the report of the Medical Research Council came to the conclusion that, from the point of view of genetical hazards, "the upper limit, which future knowledge may set to the total dose of extra radiation which may be received by the population as a whole, is not likely to be more than twice the dose which is already received from the natural background; the recommended figure may indeed be appreciably lower than this". On this evidence, the danger limit has already been reached or even exceeded in countries where X-rays are used extensively for medical purposes. Against this damage to future generations we must, however, set the benefit to the present one and, although all means must be used to cut down avoidable exposure to radiation, a high amount of exposure will remain unavoidable if the present standards of medical service are to be maintained.

FEEDING THE HUNGRY

The practical way to wage war on want was the theme of an outstanding address at St. John's College, Annapolis, Maryland, on April 9 by Mr. Gerard Piel, publisher of *The Scientific American*. Following an account of the way in which science has given man unlimited power and opportunities to change the material conditions of life, Piel shows how it is now possible to bring the elimination of want within the reach not only of the present generation but also of all future generations. Want is no longer a challenge to technology, but to economics and politics; it is a social problem. Thanks principally to the control of mortality, the underprivileged peoples are living longer and feeling well enough to do something about their plight. These aroused people are still extracting the irreplaceable resources of their lands to feed the voracious appetite for raw materials of Western peoples. At present the

United States imports from overseas iron ore, bauxite, oil and a host of commodities in greater volume than ever before. In some American sectors the technology is perilously dependent upon riches supplied so cheaply. The goodwill and compliance of the natives have immediate relevance to the American price structure.

It is impossible to stop at the churlish counsel that the Colonials should reduce their numbers. Their population is rising because the modicum of sanitation introduced to protect white Colonials in their midst has reduced their rate of mortality as well. Their numbers are increasing, according to United Nations studies, at a rate that exceeds 1 per cent per annum. Since the end of the Second World War their material condition has been in corresponding decline; their calorie intake has actually fallen.

To offset the claim of population growth and reverse the decline in their condition, they must increase their production at a rate greater than their population growth. The larger the differential, the faster will their lot improve. Such an objective is not only technologically but also politically and economically feasible. American industrial growth has averaged 5 per cent over long periods; it has reached 8 per cent under intense pressure. The growth of agricultural output has correspondingly proceeded at the rate of 2 per cent in normal times. In response to the economic cycle and to controlled prices and other regulatory devices, it fluctuates over an even wider range. The present curtailment of grain production in the United States represents 200,000 tons, which approximates to the calorie deficit for the underfed portion of the world population.

About 500 billion dollars over the next fifty years would secure an average gain per annum of 2 per cent in industrial production and a corresponding increase in agricultural output in non-Western areas. Not all the 500 billion dollars would have to be supplied from outside. At about the halfway point the new industrial centres would begin to generate some additional capacity of their own.

Bed-rock investments, however, are not particularly attractive to the world's capital market. These involve such elementary public utilities as communication systems, including highways as well as railroads, and dams for flood control and irrigation. Investments in such projects call for the kind of funds now written off on armaments. A long-range view should be taken in looking for return on investment.

Western technology is specially qualified to contribute to the soaring demand for electrical energy which will attend industrialization programmes. But the demand for huge volumes of energy, heavy equipment and big investment would not come at the outset. First, there is need for planning and, then, engineering. Many of the early gains in these areas would be achieved with very little expenditure on capital goods. The first requirement is for brains and knowledge.

An example of what can be accomplished is furnished by Mexico. For the past twenty years the Rockefeller Foundation has been working with the Ministry of Agriculture and Animal Husbandry of Mexico. At a cost of less than 2 million dollars a year, American agronomists have been supplied to Mexico, and young Mexicans have been trained in the agricultural sciences. In this period, the food production of the country has risen 80 per cent. The gains have been achieved by improved yields of Mexico's own staple crops, the development of new varieties of wheat and potatoes and the establishment of something like the American county-agent system for farmer education. Not a single tractor or fertilizer plant is in the expense account; the money has been spent on the intangibles of information, education and expert consultation. The 4 per cent per annum gain safely exceeds the 3 per cent increase in population and has brought an improvement in the people's diet which is already showing up in vital statistics.

Somewhere in American material and intellectual resources the capacity to expand on this precedent could be found. If a beginning could be made, it would soon be possible to have additional wealth and brains available for the task as a result of the attenuation of the arms race on which prosperity now rests so heavily and insecurely.

SYMPATHETIC POSTGANGLIONIC MECHANISM

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DURING recent years it has been demonstrated that acetylcholine exerts an action in various organs similar to that of sympathetic stimulation. Since this action is seen in the presence of atropine and is also exerted by nicotine, it follows that the action is not a muscarinic but is a nicotinic action. An example of this action is the contraction of the arrectores pili muscles in the skin of the cat's tail. This was first described by Brücke[1] for acetylcholine, and a few years later by Coon and Rothman[2] for nicotine. Most of the hair was removed from the cat's tail except for a few tufts, and acetylcholine or nicotine was injected into the skin at the base of the tufts. Pilo-erection was then observed. Normally the pilomotor muscles are caused to contract by sympathetic stimulation, and they also contract after the intravenous injection of adrenaline or noradrenaline. Other examples of sympathomimetic effects caused by acetylcholine or by nicotine in the presence of atropine are the relaxation of the isolated intestine of the kitten by nicotine[3]; the acceleration of the isolated atria of the rabbit[4] and the constriction of the vessels of the perfused rabbit ear by acetylcholine and by nicotine[5]; the contraction of the isolated nictitating membrane of the cat by nicotine[6]. de Burgh Daly and Scott (unpublished work) have observed that acetylcholine injected into the splenic artery during perfusion of the spleen with blood caused contraction of the spleen. We are grateful to them for allowing us to quote this result.

These nicotine-like effects of acetylcholine, exerted at sites peripheral to sympathetic ganglia, thus