of the light-water-cooled and gas-cooled types, and possibly in later years the organic cooled type.

A centre for nuclear research and development is being completed at Tokai-mura, and an institute for plasma physics is being set up on the Higashi-yama campus of Nagoya University. The institute will consist of seven research divisions covering theoretical studies and high-temperature generation experiments. An investigation of the required high-voltage supply and of the pinch effect was initiated in 1957 at Osaka University and since then plasma physics research has been carried out at Tohoku University, Tokyo University of Education, Tokyo University, Nagoya University and Kyoto University. At present there are approximately sixteen different forms of apparatus planned or under construction by twelve plasma physics research groups in Japan.

In the chapter of the annual report dealing with uses of radiation it is stated that most of the radioisotopes used in Japan are imported. During 1960 a total of 55,000 curies were imported, consisting mainly of

cobalt-60, phosphorus-32 and iodine-131. By the end of March 1961, 867 establishments, representing medical organizations, private firms and universities and research institutes, in approximately equal numbers, were using radioisotopes. JAERI is preparing for full-scale production of radioisotopes in order to fulfil the future domestic requirements. The first six isotopes to be produced will be sodium-24, phosphorus-32, sulphur-35, potassium-42 and gold-198.

Other chapters of the report deal with nuclear equipment and materials; radioactivity surveys; treatment of radioactive waste; regulations and radiation protection; and training of scientists and engineers. It is considered that 11,000-13,000 scientists and engineers in nuclear energy will be required in the next ten years and it will be necessary to train and educate some 8,000 in those ten years. At present, the possible number to be trained each year is 150-200 at universities, about 200 at JAERI and NIRS, and 90 at institutions outside Japan.

S. WEINTROUB

GASEOUS OPTICAL MASERS

BELL Telephone Laboratories Inc. have issued a brochure describing recent work at Murray Hill, New Jersey, on the gaseous optical maser. The Bell Laboratories are the most active single organization in this field, and have recently extended the range of wave-lengths available from the maser. The first type of gas discharge optical maser, initially operated by Javan, Bennett and Herriott in February 1961, used a helium-neon mixture and produced an output at 1.15μ . Since then, population inversion sufficient to support maser oscillation has been obtained in gas discharges in pure inert gases (helium, neon, argon, krypton and xenon) providing a total of fourteen different wave-lengths in the range 1.618 - 2.189μ . Inversion has also been achieved between two levels of the oxygen atom by dissociating molecular oxygen in collisions with an inert gas atom, either argon or neon, in a metastable state, using a discharge in a mixture of oxygen and the inert gas. The maser output in this case is at $8446\text{ \AA}$. The shortest wave-

length, and consequently the most useful for applications involving high-efficiency photoelectric detection, lies in the visible at $6328\text{ \AA}$, and has been obtained from a helium-neon maser with mirrors having a high reflectivity at this wave-length.

Power outputs of these new masers are in the range from a fraction of 1 mW to 10 mW. The experimental work has been done with masers using external confocal mirrors and a discharge tube having end windows at the Brewster angle to the emergent beam, thus eliminating, for the appropriate plane of polarization, reflexion and consequent energy loss at the windows.

The information in the Bell Telephone Laboratories brochure is an indication of the great effort which is being put into the development of the gaseous maser, which is already being applied to a number of research problems and may, in the future, find uses in the communications field.

J. H. SANDERS

EFFECT OF MOISTURE MOVEMENT OF NATURAL AGGREGATE ON CONCRETE

SOME years ago investigations of concrete failure, thought to be due to the chemical reactivity of certain rock-types involved with the cement during hydration, were carried out in the United States and later in the United Kingdom. Arising from this, certain rock-types, for example, some dolerites, especially those containing the chlorite mineral chlorophaeite, became suspect. Experimental work was based largely on chemical and petrological studies to determine potential reactivity with alkalis released during hydration of Portland cement in concrete involving aggregates dominated by supposedly unstable components. Methods of determination of such components were tentatively laid down by the American Society for Testing Materials (*Proc.*, 48, 1948; and *Standards*, 1952), and in the United Kingdom F. E. Jones has discussed the subject in some detail (*National Building Research Studies*, Nos. 14, 15, 16; 1952).

The evidence from this experimental work cannot be considered as conclusive; in fact, some of it is so conflicting as to raise grave doubts on the alleged chemical vulnerability of certain dolerite aggregates, including natural gravels containing these rock-pebbles, or others loaded with acid volcanic types, also suspect. There is at present what appears to be a more convincing explanation of this type of concrete failure. In a paper by L. C. Snowdon and A. G. Edwards, entitled "The Moisture Movement of Natural Aggregate and its Effect on Concrete" (*Concrete Research*, 14, 109; 1962), is described the work of the Scottish Laboratory of the Building Research Station on the failure of pre-cast concrete products in which certain crushed dolerite aggregates had been used. It is pointed out that in Scotland dolerite aggregate is extensively used in concrete.

The interest of the Department concerned "... became focused on its performance in 1952 when

very severe cracking developed in concrete specimens after a single winter's exposure on the exposure site at Thorntonhall, near Glasgow. It was later found that the dolerite rock itself exhibited large dimensional changes in water content". Volume changes due to chemical reaction were investigated but not substantiated. Since dimensional changes on wetting and drying of the rock itself occurred, a study was made of the expansion and contraction caused by

moisture in various Scottish dolerites and concretes made from them. The experiments were extended to other rock-types as well as natural sands and gravels used as aggregates for concrete. The arguments in this paper are convincing and establish that many natural crushed rock and gravel aggregates undergo changes of volume as they take up water, thus influencing both the shrinkage and the durability of the concrete in which they are incorporated. H. B. MILNER

DEMOGRAPHY OF MAURITIUS

THREE hundred and fifty years ago the island of Mauritius was uninhabited by man. The only creatures there were some indigenous reptiles and birds, and a few domestic animals left by passing sailors. To-day, the dodo is extinct, but within the island's narrow confines lives one of the most rapidly growing human populations in the world.

Mauritius is a hurricane-battered island in the Indian Ocean. It is about 500 miles east of the island of Madagascar, more than twice that distance from the south-eastern coast of Africa, and 200 miles north of the Tropic of Capricorn. In a land area of 720 sq. miles, there are 990 Mauritians for every square mile, an immense burden for the island's meagre natural resources and limited facilities. Until 1946, the rate of natural increase was low. Immigration accounted for almost half the total growth. In 1946 there were 428,000 people on the island. Recently, a dramatic shift in the survival pattern upset the two-centuries-old balance between births and deaths which had held the population in check. In just five years, the death-rate dropped from 36 to 14 and the birth-rate rose from 38 to 50 per thousand of the population per year.

It is estimated that, in 1961, there were 656,000 people on the island, an increase of more than 50 per cent in only 15 years. During the period, natural increase averaged 2.9 per cent a year, one of the highest rates in the world. Immigration had not been an important feature in population growth. By 1961 the Mauritian death-rate was 10, lower than that of the highly urban-industrial United Kingdom. The

Mauritian birth-rate had receded to 40, a rate typical of those found in less-developed countries. Should the phenomenally rapid multiplication of people continue, Mauritius would have a population of more than two million in the year 2,000—a three-fold increase in only 39 years.

One of the most serious consequences of this over-rapid growth is a population with a bottom-heavy age structure which adds to Mauritius's economic difficulties. To-day, 44 per cent of the population is under 15 and another 3 per cent is 65 years or older. If the rate of population growth is maintained, the increase in the economically dependent age-groups could strangle the economy. In less than 25 years, the number of children under 15 alone would be larger than the entire population in 1960.

This island is one of the few less-developed countries with a tradition of reliable vital statistics, introduced by the British. Thus, Mauritius serves as an almost perfect small-scale example of how too-rapid population growth can depress living-levels when the resource base is meagre and limited.

There seems to be but one ray of hope in Mauritius. Although the birth-rate is still alarmingly high, it has declined from its record peak of 50 in 1950 to 40 in 1961. The way in which the rising population of Mauritius may be controlled has been described by Robert C. Cook, editor of *Population Bulletin**.

* Population Reference Bureau, *Population Bulletin*, 18 No. 5: August 1962: *The Story of Mauritius—From the Dodo to the Shark*. Pp. 93-116. (Washington, D.C.: Population Reference Bureau, Inc., 1962.) 50 cents.

LACK OF ACTIVATION OF PHOSPHORYLASE BY ADRENALINE DURING ITS PHYSIOLOGICAL EFFECT ON INTESTINAL SMOOTH MUSCLE

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AN activation of phosphorylase by adrenaline has been observed in liver, skeletal muscle and heart muscle *in vitro* and *in vivo*¹. When conventional experimental procedures were used, similar results were obtained from isolated intestinal smooth muscle preparations from the taenia coli of the guinea pig². An improved technique was used for the experiments to be described in this communication, and the results show that an activation of phosphoryl-

ase does not occur in the tissue while the physiological effect takes place, and that earlier results^{2,3} must be ascribed to a conversion of phosphorylase *b* to phosphorylase *a* during the period which elapsed between the removal of the tissue from the adrenaline-containing medium and the assay of enzymatic activity. As these observations are limited to a single type of smooth muscle, they do not rule out the possibility that activation of phosphorylase has a relationship