

structure of a molecule (Fig. 2) and at very little cost.

LABORATORY PRACTICE

Build Your Own Chemostat

from our Microbiology Correspondent

MEMBERS of the ARC Unit of Nitrogen Fixation at Brighton have developed a low cost chemostat-type of continuous culture apparatus and have provided a useful service to many of their fellow microbiologists by describing its construction and operation (Baker, K., *Laboratory Practice*, 17, 817; 1968). Commercial equipment has been available for several years, from Britain and elsewhere, but the cost of culture vessels and the necessary array of controls is often prohibitive. In any case, as Dr Baker remarks, to construct a "Porton-type" apparatus privately requires quite elaborate workshop facilities. Inexpensive small-scale chemostats have been operated successfully in the past, but these almost invariably lack sophisticated monitoring and control accessories. The new development will therefore encourage those who have wanted continuous culture on the cheap to invest the estimated £200 to £375 in its construction.

The growth vessel is a "Quickfit and Quartz" culture flask modified to include an overflow weir and an oxygen electrode port, and is sealed by a 5-orifice lid. The latter permits adequate entry for ancillary fittings such as a combined medium and gas inlet, sampling and inoculation port, temperature sensor, combined pH electrode and alkali-acid inlet. The central opening can be used for stirring the culture, either magnetically (as advocated by the Brighton group) or by a driven shaft. Users should not be discouraged from using the second type of agitation system, particularly if large culture volumes are intended. An attractive feature of this equipment is the wide interchangeability of components. With relatively little duplication of parts, culture vessels ranging from 500 ml. to 200 l. can therefore be assembled. In the experience of the designers, the use of silicone grease and p.t.f.e. sleeves have not created problems of bacterial contamination.

The same article includes comprehensive details of costing and of suppliers. Alternative control systems are also recommended and individual choice will be largely a matter of available funds and operational requirements. For example, temperature control can be effected by means of a platinum resistance thermometer and precision temperature controller (fairly expensive), a fixed point contact thermometer relaying to an infrared lamp via a hot wire vacuum switch (less expensive) or a constant temperature room or incubator (cheapest). Likewise, a glance at manufacturers' catalogues will enable the basic equipment to be adapted for more specific needs. Dr Baker refers to procedures such as sterilization, inoculation and sampling and to the determination of dilution rates.

SOIL SCIENCE

Salts of the Earth

from a Correspondent

THE Ninth International Congress of Soil Science, held in Adelaide, South Australia, from August 5 to 15,

attracted 865 members from 53 countries. The choice of venue was a fitting recognition of the great contribution Australian soil scientists have made to the subject, particularly in the past decade. Participants from elsewhere were able to appreciate the immensity and range of the Australian scene, although the exceptionally wet and cold winter was hardly typical of this most arid continent.

All the papers were preprinted. They were refereed before acceptance, and about half those submitted were rejected. This meant a much higher standard of presentation and a more informed and penetrating discussion than at previous congresses in the series. Only a few obvious travel vouchers seem to have slipped past the referees.

Rarely in as eclectic a domain as soil science does a single contribution stand alone as a trend setter; it is more usual for a group of papers to reflect new ideas or the impact of a new technique. In soil physics and chemistry, transport processes were fully covered and quantitative studies of the movement of ions in profiles and near roots were described where only the movement of water has previously received detailed attention. It is also becoming more clearly recognized that, although much of the soil colloid is composed of crystalline clays, the surfaces of the colloidal particles are usually coated by amorphous materials which modify their behaviour and make it more difficult to apply work on pure clays to field problems.

In soil fertility and management, gas chromatography has brought a much clearer recognition of the widespread loss of available nitrogen by reduction of nitrate to nitrite and its decomposition to N_2 , N_2O and NO_2 .

In soil classification and genesis, the protagonists of a variety of "natural" systems of classification, based on properties the genetic significance of which is supported at best by genuine insight and experience and at worst by "hunch" or the conformist pressure of big organizations, now face the computer aided techniques of numerical taxonomy and cluster analysis which provide, so some allege, more objective criteria for grouping. The idea that clay is eluviated from an *A* horizon to form an illuvial *B* horizon is historically one of the most cherished tenets of soil genesis. Many Australian soils seen by members on the congress tours do indeed show marked increases of clay content below the top soil. But there is increasing evidence that the clay has in fact been destroyed or removed laterally from the *A* horizon and very little moved into the *B* horizon, so that soils in many parts of the world will probably be re-examined from this point of view in the next few years.

As soil science develops, there is a tendency for members to separate into two groups—those who prefer to work with well behaved systems such as glass beads or sodium bentonite or, best behaved of all, mathematical models, and those prepared to take the soil as it is, in all its complexity. The concepts, techniques and terminology of the first group, firmly rooted in physics, chemistry or crystallography, become more and more esoteric, and the problems posed by real soils often seem insufficiently amenable to refined techniques to fire the imagination. Joint sessions at this symposium helped to bring the two groups together, but the general lectures which had been a feature of previous congresses were missed by many.