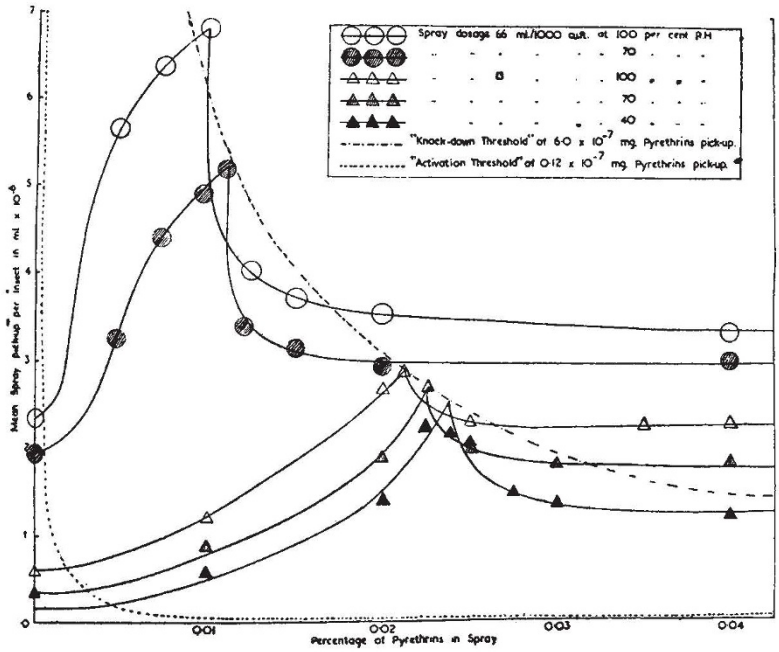

Fig. 2. VARIATION OF SPRAY PICK-UP BY *Aedes ægypti* WITH HUMIDITY AT VARIOUS SPRAY DOSAGES.

domestica L., *Culex pipiens* L., *Coccinella septempunctata* L., *Vespula vulgans* L., and *V. germanica* Fabr., queens and workers, and *Rhagonycha fulva* Scop., confirms the existence of both threshold values for these insects also.

These considerations have a special bearing on the methods of bio-assay of insecticides with flying insects, and raise again the questions of standardizing the activity of the insects[4] and the standardization of the 'mean free flight' of the insect; and they support the views expressed by C. A. Murray[6] on the subjects of dosage measurement and pick-up distribution in Peet-Grady testing. Our method of investigating insect responses in toxic sprays opens up a new line of attack on the form of the dosage – mortality curve.

An important result of the investigation is to suggest that neither the amount of spray liquid nor the amount of toxic agent received by the insect can any longer be considered to be proportional to the spray dosage if an irritant substance is present in the spray and is approximately proportional to the toxicant concentration only over a limited range. It may prove possible to relate the changes of response evident in the spray pick-up – toxicant concentration curves with the deviations shown at high and low mortalities from the conventionally sigmoid dosage – mortality curve.

We have also investigated the rate of pick-up of sprays containing various concentrations of pyrethrins on *Aedes ægypti*, and find that for these mosquitoes the 10-minute exposure period for spray is the most suitable, at least for water-base sprays.

Experiments designed to examine the influence of reducing the humidity in the spray chamber show that the overriding physical effect, for water-base sprays, is to reduce the effective dosage/nominal dosage ratio. Any biological effects which may occur are not evident under our experimental conditions, which have not, as yet, included any lengthy conditioning period at the altered humidity.

The analytical method which has been described may be applicable under conditions which rule out biological investigation. For example, the flight-stimulating action of pyrethrins can be estimated biologically up to a certain concentration of poison per cubic foot by including D.D.T. in the spray and observing the resultant lethal effect; but above this concentration this biological method fails because too high a kill is obtained. There is no such limitation to the use of the chemical method.

It is hoped to extend this work to cover the responses of a series of insects of varying structural characteristics, to examine the action of other insecticidal and irritant compounds both in aqueous and in oil sprays and to combine the methods of determination with other observations on the deposition and action of insecticidal films.

We are indebted to the Chief Scientific Officer, Ministry of Supply, for permission to publish this work.

[1] David, W. A. L., Insecticides Development Panel, Ministry of Production, (45), 220 (unpublished).
[2] David, W. A. L., Insecticides Development Panel, Ministry of Production, (45), 215 (unpublished).
[3] David, W. A. L., Insecticides Development Panel, Ministry of Production, (45), 236 (unpublished).
[4] Bracey, P., Insecticides Development Panel, Ministry of Production, (45), 221 (unpublished).
[5] Page, A. B. P., Stringer, A., and Blackith, R. E., Insecticides Development Panel, Ministry of Production, (45), 232 (unpublished).
[6] Murray, C. A., *Soap and San. Chemicals*, **16**, (6), 111 (1940).

SCIENTIFIC RESEARCH IN AUSTRALIA AND NEW ZEALAND

THE second discussion on the organisation of science in the British Commonwealth arranged by the Society for Visiting Scientists was held at the Society's House at 5 Old Burlington Street, London, W.1, on December 19. Prof. M. L. E. Oliphant presided, and the speakers included Dr. J. C. Andrews, member of council of the New Zealand Department of Scientific and Industrial Research; Dr. F. P. Bowden, head of the Research Group on the Physics and Chemistry of Rubbing Solids, University Chemical Laboratory, Cambridge; Mr. G. B. Gresford, head of the Australian Research Liaison Office, Australia House, London; Dr. C. H. Kellaway, director of the Wellcome Research Institution; Prof. Eric Ashby, recently scientific attaché to the Australian Legation in the U.S.S.R.; Mr. Edgar Booth, chairman of the Institute of Wool Secretariat; Dr. E. H. S. Burhop, lecturer in the Department of Applied Physics, University College, London; Dr. Julian Huxley; and Mr. H. E. Wimperis, scientific adviser to the Australian Government.

In Australia and New Zealand, physical, ecological, historical and political factors influence both the nature of the scientific problems to be solved and the conditions for their solutions. Australia is in general arid, with two thirds of its area semi-desert, but with

tropical conditions in the north ; it is relatively poor in natural resources. Owing to its long geological isolation, it is rich in primitive and interesting forms of life, but these are rapidly disappearing, and introduced species often become pests. Until the War, Australia was largely dependent on agriculture, notably wheat and wool ; but the War has necessitated the development of secondary industries, such as aircraft bearings and 'jelled' petrol, both of which were successfully developed by teams of research workers, largely young Australian graduates. The wool industry has also found it necessary to finance research in order to compete with the progress of synthetic fibre, which causes considerable anxiety.

Politically, Australia is a federation with seven parliaments and governments of the six States and of the Commonwealth. This raises problems in research ; for example, in forestry and some other fields, the Commonwealth has to obtain the permission of the States for the authorization of research grants.

Historically, Australian ties have been almost wholly with Britain, on which she relied for scientific ideas and as a training ground for advanced students ; but during the War Australian science has been forced to depend more on its own resources, while at the same time making new contacts with the United States. The main body concerned with research is the Council for Scientific and Industrial Research, which operates free from departmental control or Government interference, largely owing to the personality of Sir David Rivett. In addition, Government research is done by the Munitions Supply Laboratories, the Commonwealth Observatory, the Department of Agriculture and Mines, the National Health and Medical Research Council, and other bodies. The last-named Council is largely concerned with public health services, and there is a good deal of backing for the establishment of a body more purely concerned with medical research, such as the Medical Research Council in Britain.

Recently, it has been announced that a Commonwealth Experimental Station is to be set up in the sparsely populated area of Central Australia for research on guided missiles and pilotless aircraft that will be needed for tests on flight at speeds near that of sound.

For biology and medicine there are several research institutes of high standard. Both at Brisbane and in Queensland, research on the effects of tropical conditions, and on tropical diseases, is being carried out. In Sydney there are two institutes of medical research, in one of which interesting work on acoustics is proceeding. There is also the University Medical School, which includes an R.A.F. research station : this links up with the valuable research of the Physics Department on the effects of gravity and on anti-gravity measures. In Adelaide there exists an institute which is unique in combining research on human and animal diseases.

Nearly every speaker stressed the fact that university research suffers from the heavy teaching duties of the staff. It is not so much the high ratio of students to staff as the too great number of different courses which one man is required to give, and the undue size of first- and second-year classes. The present tendency towards entering universities at a low age (the average is now only just over seventeen) should be reversed ; the standard and ceiling of school teaching should be raised, and more use made of junior technical schools. At the moment, no university gives a higher research degree such as Ph.D. The institution of such degrees should materially increase the number of research students ; in addition, something should be done to guarantee posts to those who do well in their post-graduate research.

The present tendency had been to lose an undue proportion of scientific talent : many graduates who have gone to England for post-graduate work or research have not returned to Australia. To obviate this, and to make the best use of the Empire's scientific man-power and of its various fields of research, a comprehensive scheme is needed. This should include provision for senior workers from Britain to visit Australia and other Dominions for periods of one to several years, and for young British graduates to begin their research careers in the Dominions without thereby reducing their chances of return later.

In the opinion of several speakers, Australia should concentrate on those fields of research in which she naturally provides special opportunities : this would attract workers from other countries. Further, cheaper and easier travel for teaching staff and research workers is essential if intellectual isolation is to be avoided. It would be desirable to establish some common organisation for Dominion higher education and research, analogous to the Colonial Higher Education Committee. Within Australia there is need for some scientific public relations organisation to explain the value and interest of science to the public.

Scientific workers in New Zealand suffer likewise from isolation and the lack of contacts with colleagues in the same or related fields, and the public is also far from appreciating the value of scientific research, although the War had an enlivening effect in this direction. Most scientific work comes under the governmental Department of Scientific and Industrial Research, established in 1926. Most of its work is concerned with agriculture, as New Zealand is almost entirely dependent on agricultural produce. It also has physical and chemical laboratories and meteorological stations. Some of the major problems are those of soil erosion, the economic use of fertilizers, animal improvement, standardization, and questions connected with high rainfall, rivers and forestry.

The University of New Zealand consists of six university colleges, of which two are agricultural. Research opportunities and activities are not so great as could be wished. An interesting scheme has just been set up by the Research Council of the Department of Scientific and Industrial Research, whereby generous fellowships are made available to graduates, on condition that they bind themselves to work in New Zealand for a minimum number of years after the end of their training. It is hoped thus to prevent the leakage of good workers to Britain and other countries.

Dr. Andrews also stressed the need for the over-all co-ordination of Empire research. His views on this form a fitting conclusion to the account of this interesting meeting. He is firmly convinced that by full co-operation between the various Dominions and Colonies, including the setting-up of well-equipped scientific institutes in the regions most suitable for particular lines of research, a much fuller flow of scientific talent would be maintained in both directions between Britain and other territories, and that not only the individual Dominions and Colonies would benefit markedly, but also Britain and the Empire as a whole.