breed similar to the Santa Gertrudis produced by crossing Brahman and British beef cattle. They are approximately half Brahman compared with the three-eighths of the Santa Gertrudis. The importance of this is difficult to over-estimate: there are a few British cattle with quite high tick-resistance, but it would obviously take a long time to raise the overall tick-resistance to a high level. On the other hand, one cross with a Brahman bull raises tick-resistance about ten-fold, and we can still select for tick-resistance. These facts were well understood by Dr. R. B. Kelley, who contributed so much in this field, and they have, in fact, been well established, even if their importance has not been well or widely accepted, for at least forty years. Unfortunately, for a long time the subject of 'tick-resistance' seems to have caused considerable confusion in the minds of people regarded as

experts on ticks, or at least they have not appreciated its importance. However, a few people have had a clear understanding, and a paper published early in this century described how pastures grazed by tick-resistant cattle were steadily 'cleansed' of ticks. The Droughtmasters and Brahman-hybrid cattle are also considerably more resistant to babesiosis³ than European cattle.

The Farm, of some 700 acres, is only seven miles from the new Veterinary School at St. Lucia which was opened in August 1961 by the Hon. C. F. Adermann, Minister for Primary Industry. There are now almost 100 students in each of the first two years of this school, and 36 post-graduate students.

JOHN FRANCIS

¹ Little, D. A., *Austral. Vet. J.*, **39**, 6 (1963).

² Francis, J., and Little, D. A. (submitted to *Austral. Vet. J.*).

³ Francis, J. (submitted to *Austral. Vet. J.*).

AUSTRALIAN DEFENCE STANDARDS LABORATORIES

THE main sections of the illustrated annual report of the Department of Supply of the Australian Defence Standards Laboratories for the year ended June 30, 1962, deal with the work carried out in the fields of physics, metallurgy and chemistry.

The Physics Division consists of the metrology, electronics, electrical measurements, chemical physics and optics, and xerography groups and branches in New South Wales and in South Australia. The two items of special interest in the Division's activities during the year are the production of calibration tables for platinum resistance thermometers by means of an IBM 1620 digital computer and the acquisition of one of the highest precision Mueller resistance thermometer bridges yet built.

The bridge, which incorporates all the latest developments and modifications from the United States National Bureau of Standards, has nine dials covering the range 0-422 ohms in increments of microhms. The Division's 'Varian' wide-line nuclear magnetic resonance spectrometer was used in the study of a number of chemical and physical problems, including the determination of the separation between hydrogen atoms in the water of crystallization in calcium sulphate hemihydrate and the observation of some nitrogen, zinc and chromium resonances. The resonance of the tin-119 isotope, which is of low natural abundance and of relatively poor sensitivity, was recorded in a series of liquid tributyl tin compounds of particular interest in the development of plastics resistant to corrosion and to penetration by fungi. The shift of the tin resonance in each molecule relative to the resonance of the stannous ion was measured and explained on the basis of simplified models.

Mention was made in the 1961 annual report of investigations on the vaporization processes occurring on the surfaces of metal electrodes when subjected to low-current long-duration pulsed discharges. These have been continued. In the field of solid-state physics small-scale experimental work was started on hot carrier conduction in silicon. In the metrology group a method was devised for the use of the 'Talyrond' roundness measuring instrument for the accurate measurement of standard ring gauges, and an experimental mercury manometer of 5-cm bore was constructed for the measurement of pressures of 0-60 millibars to an accuracy of 10^{-2} millibar.

The Metallurgy Division was mainly concerned with the production of pure chromium and with the study of the properties of chromium and chromium alloys. In collaboration with Dr. P. A. Jacquet a new technique was developed for the preparation of chromium for microscopic examination with either the optical or electron microscope. Internal friction studies established that

the extent of magneto-mechanical damping and associated hysteresis in chromium is markedly dependent on grain size and on impurity content. Measurements of the dynamic shear modulus of chromium at 1 c/s over the temperature-range -100°C to 100°C showed that the modulus has a maximum value at the antiferromagnetic transition temperature (Néel temperature). The metallographic study during 1961 of abraded germanium surfaces led to the surprising result that the damaged layer consisted of cracks and not of large densities of dislocations. This work was extended during 1962 to the examination by microscopy and by taper-sectioning techniques of the extent to which the damage is removed by etching with 'CP-4' reagent. It was found that the reagent penetrated the cracks and opened them into broad crevices, but that at the same time the surface was smoothed out with the production of a characteristic cellular pattern. The damage in electric spark-machined surfaces was also studied.

Some interesting results were obtained from the structural studies and stereochemistry investigations in the Chemistry Division of the aliphatic cyanides and isocyanides which, despite identical molecular formulae, differ considerably in chemical and physiological activity. The contribution of the isocyanide bond to the molecular refraction is much greater than that of the cyanide bond, and the effects of hydrogen-bonding solvents on the infrared spectra of the two families of organic compounds and of carbonyl compounds differ markedly. Other activities in the Chemistry Division include the determination of gases in metals, in particular oxygen in chromium by the vacuum fusion and the Adecock chemical methods, and phosphorus in irons and steels using quinoline molybdate instead of the more usual ammonium molybdate, and X-ray fluorescence analysis of the ternary alloys Fe-Cr-Ni, Cu-Ni-Zn and Cu-Zn-Sn.

The annual report lists the various personnel of the Laboratories and their status, and gives details of the publications by members of the staff during the year under review. The staff numbered 724 on June 30, 1962—an increase of 37 during the year, reflecting the somewhat easier position in the recruitment to sub-professional positions. Nine members of the staff spent all or part of the year in the United Kingdom. Visitors to the Laboratories included the Australian Minister for Supply; Prof. K. H. Hunt of Monash University; Prof. S. Kikuchi of Tokyo University; Sir Leslie Martin, chairman of the Australian Defence Research and Development Policy Committee; Dr. P. Cheosakal of the National Research Council of Thailand; Dr. W. J. Youden of the United States National Bureau of Standards; and a party of sixty officers from the Australian Army Staff College.

S. WEINTROUB