given by a series expansion of the correlation energy of the metal electron-gas in powers of $1/R$.

From the lattice energy as a function of R , the radius of the elementary sphere R_0 , the lattice energy U_0 , the sublimation energy S , and the compressibility κ in the state of stable equilibrium can be computed in the same manner as in the publications quoted. It is further possible to compute the work function w according to $w = -\partial U/\partial z$, where z represents the number of metal electrons per metal atom. (It is quite easy to give U for the coefficients A_i as a function of z .) Based upon the Thomas-Fermi-Dirac model of the metal ions, we get, without the help of empirical or semi-empirical parameters for the alkali metals, the data recorded in the accompanying table. R_0 is expressed in 10^{-8} cm., U_0 and S in kcal./gram-atom, w in e-volts and κ in 10^{-12} cm.²/dyne units; and I should like to emphasize that U_0 , S , w and κ were computed by using the theoretical values of R_0 . This statistical model cannot be employed in the case of lithium, because in that metal the number of the core electrons is too small.

		Na	K	Rb	Cs
R_0	theor.	2.28	2.51	2.73	2.83
	emp.	2.09	2.58	2.77	2.98
U_0	theor.	-141.2	-130.9	-122.1	-119.0
	emp.	-148.1	-125.9	-120.7	-113.4
S	theor.	23.3	31.4	26.3	29.6
	emp.	30.2	26.4	24.9	24.0
w	theor.	2.35	2.33	2.29	2.28
	emp.	2.3	2.2	2.1	1.9
κ	theor.	15.9	22.6	31.0	35.1
	emp.	16.2	41.7	33	54
κ extr. to $T = 273^\circ$		7.7	20.7	—	—
κ extr. to $T = 0^\circ$		—	—	—	—

For the sake of comparison we have given in the table, besides the theoretical results, the corresponding experimental values. From the data we can see that the agreement between theoretical and empirical values is quite satisfactory. In the case of κ a direct comparison with experimental values cannot be carried out, because the calculations refer to the absolute zero of temperature whereas the measurements were performed at much higher temperatures. The real empirical values of κ at $T = 0^\circ$ lie between the values we get by linear extrapolation of the empirical values to $T = 0^\circ$ and $T = 273^\circ$. These values are given in the last two rows of the table in cases where the extrapolation could be carried out. As can be seen, we may expect that the theoretical values of κ will agree well with the empirical values at $T = 0^\circ$. The discrepancy between the theoretical and experimental values of w may have its origin in the circumstance that the double layer on the surface of the metals has been neglected throughout the computation of w .

With the help of the formula for U , we can derive the relation between the volume and the pressure at $T = 0^\circ$ by using the equation

$$P = -\frac{dU}{d\Omega} = -\frac{1}{4\pi R^2} \frac{dU}{dR},$$

where P denotes the pressure and Ω the volume of the elementary sphere. These results are in good accord with the experimental values found by Bridgman⁴. The agreement can be well seen in the accompanying figure.

The theoretical results can be further improved by using for the electron distribution of the metal ions the more accurate wave mechanical distribution of Hartree or Hartree and Fock instead of the statistical distribution. Using the [Hartree-Fock distribution⁵,

we obtain for potassium, in the above-mentioned units: $R_0 = 2.59$, $U_0 = -127.0$, $S = 27.5$, $\kappa = 26.1$.

It is possible still further to improve this theory by the introduction of the field of the modified potential into the statistical model of metals. Thus for alkali metals the eigen-function for the distribution of the metal electrons can be quite easily determined, and one finds⁶ practically the same constant distribution which was assumed in the introduction of this article. For the alkaline earths similar computations are possible; the agreement between the theoretical results and the empirical data—as was to be expected—is not quite as good as for the alkali metals, but nevertheless it is still quite satisfactory. A more detailed presentation of the results will be published elsewhere.

¹ Compare especially Gombás, P., *Z. Phys.*, 99, 729 (1936); the other works are quoted in Gombás, P., *Z. Phys.*, 117, 322 (1941).

² Gombás, P., *Z. Phys.*, 118, 164 (1941); 119, 318 (1942).

³ Gombás, P., *Z. Phys.*, 119, 318 (1942). The limiting radius r_0 used there can be replaced here by the limiting radius of the statistical Thomas-Fermi-Dirac ions.

⁴ Bridgman, P. W., *Proc. Amer. Acad. Sci.*, 72, 207 (1938). Bardeen, J., *J. Chem. Phys.*, 6, 372 (1938).

⁵ Hartree, D. R., and Hartree, W., *Proc. Roy. Soc., A*, 166, 450 (1938).

⁶ Gombás, P., *Math. u. Naturwiss. Anz. d. Ung. Akad.*, 59, 125 (1940).

IMPERIAL CANCER RESEARCH FUND

REPORT FOR 1945-46

DR. W. E. GYE, director of the scientific work of the Imperial Cancer Research Fund, gives, in his report (Pp. 42. London: Royal College of Surgeons, 1946) for the year 1945-46, the good news that war-time difficulties are now being overcome and that projects contemplated in 1939 will soon be resumed. During the War, important work has been done in the Fund's laboratories on the action of war gases on the eye. This included work on lesions caused by mustard gas and trials of British anti-lewisite (BAL) (see *Nature*, 156, 616; 1945). It is hoped that publication of results of studies of the action of other agents used in chemical warfare and of a general consideration of chemical injuries of the eye will be permitted in the future. The Fund's war work has shown that greater consideration should be given to the eye as an experimental medium.

During the past year, the Fund's laboratories have been occupied with work on carcinogenesis, hormones, mammary cancer and the chemotherapy of cancer. The study of the relation of the metabolism of sulphur to the occurrence of cancer has indicated that disturbance of sulphur metabolism impairs carcinogenic activity, the inhibition of sulphur metabolism being parallel to inhibition of carcinogenic activity. This work has also indicated that sulphur plays no part in the elimination of carcinogenic substances. The results obtained are in harmony with the hypothesis that a primary action of carcinogens is their fixation to unknown sulphhydryl-containing constituents of the cell.

Work on mammary cancer has included a study of various methods of administering the milk agent and experiments on the recovery of Bittner's factor from milk taken from the stomachs of sucking mice fed by high-cancer strains. Further work has been done on the tumour-inducing activity of dried mammary cancer tissues from mice of several high-cancer strains and on the interaction of formative stimuli on mouse mammary of high- and low-cancer strains.

The caloric intake of the host influences the development of spontaneous and transplantable tumours; and dietary restriction inhibits the development of mammary tumours in mice of high-cancer strains. In some instances, this happens even after oestrogen treatment. Because many substances are now available, especially thiourea and its derivatives, which block the synthesis of thyroxine and therefore lower the basal metabolic rate, causing also hyperplasia of the thyroid, it seemed possible that substances of this kind might exert on the development of mammary cancer an effect similar to that produced by dietary restriction. Preliminary results of investigation of this hypothesis indicate that thiourea administered in drinking water to mice suffering from cancer inhibits, or at least delays, the appearance of mammary tumours in these mice. The way in which thiourea exerts this effect is being studied.

Chemotherapeutic work has included studies of the possible therapeutic value of large numbers of pure chemical substances; but no substance has yet been found which exerts a specific effect upon cancer cells. Substances are known which induce haemorrhages in tumours. Among these are polysaccharides extracted from bacterial filtrates and the alkaloid colchicine. Colchicine also arrests cell division at the metaphase by preventing the formation of the mitotic spindle. Work in the Fund's laboratories has, however, failed to inhibit mitosis of malignant cells without also inhibiting at the same time the mitoses of other cells. Further study of this action of colchicine seems, nevertheless, to be promising. The Fund's workers have also found that colchicine administered to mice with transplantable tumours causes extensive haemorrhages into the tumours, followed by shrinkage of their size and sometimes by ulceration of their surfaces. In exceptional instances, complete regression of the tumour followed. The greatest effect was exerted on soft, highly cellular and rapidly growing tumours. Similar effects were exerted by bacterial filtrates. Study of the action of pellets of stilboestrol, which were introduced subcutaneously, upon tumours the sensitivity of which to colchicine had been determined, showed that stilboestrol did not influence the growth of these tumours unless it was given in doses which were toxic to the animal. The report discusses each of these lines of work in further detail.

There has been, during the year 1945-46, an increase of £5,531 in subscriptions, and the Fund has received in legacies a greater sum than that contributed in this form during any previous year. Many of the staff have been away on war service, so that less has been spent upon wages, salaries and equipment; but wages and salaries are now higher than they were and all costs have risen. The increased activities of the coming year will, therefore, involve greater expenditure. The Fund, which seeks not only to remove one of the greatest scourges of mankind, but also to contribute fundamental facts to our knowledge of the biological basis of disease, is worthy of every means of support. G. LAPAGE

FOOD CONDITIONS IN OCCUPIED POLAND

A RECENT publication dealing with Polish problems* presents an attempt to assess "the wartime diet of the different categories of the population of Poland so as to obtain an approximate picture of the dietary needs of the population and to plan a food relief accordingly". It was published before the War ended and the assessment had to be made on incomplete information, but the probability is that the actual situation was even worse than appears—at any rate for the urban population.

The information used was that published by the German authorities themselves regarding the official food rationing system in occupied Poland. Where official information was not available, no detailed analysis was attempted; but an outline of the position is given so far as it could be judged.

Pre-war, Poland was chiefly engaged in agriculture, and prior to the overrunning of the agricultural areas in Western Europe, the Germans clearly hoped to draw good food supplies from this, the first of their occupied territories. All their planning was directed to this end.

The occupied territory was divided into two parts. That in the West (Wartheland) was incorporated into the Reich, and the remainder was classed as the "General Government" area. Food rationing and living conditions in general differed in the two areas.

In Wartheland, Polish farmers were expropriated and replaced by German colonists, and plans were drawn up for an increased agricultural production. Food regulations were detailed and seem to have been put into practice with great thoroughness. Germans, Poles and Jews were issued with ration cards of different colours and the distinction was emphasized in many other ways. The amounts obtainable on the ration were varied from period to period but were always highest for Germans and lowest for Jews; differences in quality were given a similar distribution: for example, wheat bread was given to Germans, Poles received adulterated rye bread; Germans received butter for their fat ration, Poles received rape-seed oil. The greatest distinction, however, arose from the fact that the Germans received frequent supplementary allocations of food which were not issued to the Polish population, many articles of food being forbidden to the Poles altogether.

In the General Government area conditions were much worse as, in addition to the above regulations, separate shops for the Germans were set up. These

* Analysis of the German Food-Rationing System in Poland by Leon Dmochowski. Pp. 92. (London: Polish Ministry of Labour and Social Welfare, 1944.)