has consistently proved the value of its policies. The range of genetics research reported runs from purely scientific work on *Drosophila* to studies of the myxomatosis virus, physiology of the coat in cattle concerning sweat glands and hair, to hybrid vigour.

Infective and non-infective diseases important to Australia and disease related to worm and arthropod infestation receive great attention. The geographical position of Australia has provided a great freedom from some of the devastating diseases of other countries with comparable climatic conditions and wise policy has enabled the position, all round, to be maintained. There are great risks of diseases introduced in the processes of commerce. The important work on bovine contagious pleuro-pneumonia, solidly entrenched in northern parts of the continent for a very long time, is continued. The special climatic conditions of the continent have great influence on animal husbandry, and physiological investigations into the means of obtaining the best possible results by attention to the production and management of animals that can thrive and be suitably exploited have been extensively carried out.

PRIORITIES OF HUMAN RESPONSIBILITY

THE following statement of policy concerning "Priorities of Human Responsibility" was issued after the fourth meeting of the International Trustees of the World Wildlife Fund which was held in Switzerland recently:

"The World Wildlife Fund believes that man has responsibilities of trusteeship for the natural world over which we now exercise such sweeping power. How do these responsibilities equate with other human responsibilities? The ending of all forms of human suffering is clearly of paramount importance. We must never waver in the fight against disease, hunger, the threat of war and every other kind of disaster and human misery. We must strive to make a world worth living in for everyone; but is a world without wildlife and wild places worth living in? Even when mankind is free from want and fear, will our children's grandchildren thank us if we have sealed off great wild areas of the earth from the Sun with bricks and mortar, concrete and plastics? Will they have to ask 'What was a wild animal?' or 'What was a wild place?'.

"When there is an unavoidable collision between the survival of man and the survival of wildlife, human interests must clearly prevail. It is our thesis, however, that such collisions are rare—that in most cases a little thought, ingenuity and good will can permit the co-existence of man and wildlife without which man himself is so much the poorer. Most of the species exterminated by man in historical times need not have become extinct and would not have done so if anyone had bothered about it. The survival of the dodo and the great auk would not have impeded human progress in the slightest degree.

"Thus the Fund's campaign is not a case of animals versus man. Conservation is for man, for the long-term benefit of humanity, and to ignore it is short-sighted and improvident. There is a close link between medical science and natural science, and an even closer link between the achievement of freedom from hunger and the conservation of wildlife, because both have to do with the proper use of the land and its priceless treasures.

"But there are also responsibilities for adding something constructive and uplifting to human lives as well as for saving them—responsibilities which in the field of conservation, grow daily more urgent, for the wild creatures cannot protest, and once a species becomes extinct nothing can re-create it. Ultimately, therefore, the concern of the World Wildlife Fund is with the future benefit of man and the spiritual enrichment of his life."

THE INTERNATIONAL EPIZOOTICS BUREAU, PARIS

THE report* for 1961–62 by the director, Dr. R. Vittoz, of the International Epizootics Bureau, Paris, made at the thirtieth annual conference, covers incidence of world-wide disease.

The Bureau functions through officials of the countries represented on its council and has a permanent staff in its Paris Office. Reports of its conferences are published in considerable detail and bulletins are issued giving statistical information supplied to that office. From time to time special conferences are called, in addition to the regular seasonal meetings, when particular internationally important problems arise, such as, for example, the break-out of African horse-sickness from the endemic regions in Africa in quite recent years, with great extension from the Middle East into Pakistan, India, and beyond. There is close association for relevant purposes with other international bodies such as the World Health Organization and the Food and Agriculture Organization of the United Nations. Collectively, these bodies are able to take most satisfactory action in emergency and, according to circumstances, also in the preparation of short- or long-term plans.

The functions and organizations of these bodies each strengthen the value of the others. Their knowledge of local conditions and circumstances everywhere is very good and detailed, and, with the help of the several countries, rapid and efficient action can be taken when required, experts and materials being mobilized and concentrated to the best advantage.

Many examples could be given of the manner in which the functions of the Bureau and of the other organizations with which it works have been utilized. During their existence there have been dangerous extensions of animal disease into countries previously free and, if early and effective action had not been available, losses from devastating disease would undoubtedly have been carried even further than was the case, with very serious results to countries with valuable livestock industries.

With the rapid extension of air transport within the memory of serving officials of all countries, and the risks of the possibilities that may arise from space travel in the future, the dangers of infective disease are far greater than in the past. Diseases that the veterinarian had considered to be comfortably tucked away in Africa and limited to that continent have caused very serious losses within the experience of the present working generation of experts. While known to be of the utmost importance to their endemic areas there had been little fear that their interest would be more than academic to workers elsewhere. Blue-tongue of sheep has invaded the United States and at great cost; African swine fever—quite a different virus to the unfortunately well-known scourge of most countries—has invaded the Iberian Peninsula and Mediterranean countries.

* Report for 1961–62 of the International Epizootics Bureau. Pp. 94. (Paris: Office International des Épizootics, 1962.)

As a result of the activities of these international bodies the serious problems posed by foot-and-mouth disease have been mutually assessed by the countries most nervous about its depredations, and also by the countries, less nervous, but fearing the dangerous possibility that inefficient control measures might permit extensions. An exotic and dangerous type of the virus has penetrated southern European countries and great endeavours are being made co-operatively to prevent its arrival in Western Europe.

The diseases at present causing most concern because of the difficulties about their control are dealt with in this report in great detail, region by region. Where wide-scale vaccination is useful and local means are insufficient, much effort is concentrated on the provision of materials and skilled assistance. W. A. POOL

INTERSTITIAL SOLID SOLUTIONS IN BODY-CENTRED CUBE METALS

By DR. J. STRINGER and A. R. ROSENFIELD*

Department of Metallurgy, University of Liverpool

THERE is a well-known correlation between the activation energy for self-diffusion ΔH and the melting-point T_m for body-centred cube (b.c.c.) metals[1]:

$$\Delta H(\text{eV/atom}) \approx \frac{3T_m \text{ (deg K)}}{2{,}000} \quad (1)$$

The linearity of this relation arises because the activation energy is required to overcome the binding energy for the ring of atoms through which the diffusing atom has to move. Consider, for example, an atom diffusing from one cube centre to a vacant position at the centre of the adjacent cube. If the lattice parameter is a_0, the hard-sphere atom diameter is $0{\cdot}866\ a_0$, and the tunnel between the four atoms at the corners of the cube face through which the diffusing atom has to move has an inscribed diameter of $0{\cdot}548\ a_0$. During the movement, therefore, the four atoms at the face corners are displaced from their equilibrium positions by an amount $0{\cdot}159\ a_0$. The melting-point is related directly to the binding force between atoms, and thus ΔH increases with T_m.

In general, the activation energy of any solid-state diffusion process for which the rate-determining step is the displacement of matrix atoms will increase with the melting-point of the matrix element and, irrespective of the form of the functional relationship between ΔH and T_m, one boundary condition is:

$$\Delta H = 0 \text{ when } T_m = 0 \quad (2)$$

However, when the activation energy for the interstitial diffusion of oxygen, nitrogen, or carbon in b.c.c. metals is plotted as a function of the melting-point of the solvent (Figs. 1–3), a linear relation analogous to equation (1) is obtained only for those interstitials that exhibit low solubility; those with solubilities greater than about 1 per cent[2] exhibit little variation of ΔH with T_m. Thus:

$$\Delta H = \alpha(x)T_m \text{ for interstitials with small solubility} \quad (3)$$

and:

$$\Delta H = \beta(x)T_m + \gamma \text{ for interstitials with large solubility} \quad (4)$$

In these equations, the values of α, β and γ depend only on the interstitial considered, and in general $\beta < \alpha$. It is interesting to note that recent investigations of diffusion of substitutional atoms in f.c.c. metals show that the activation energy depends markedly on solubility[3,4] although qualitatively the effects are different.

Cottrell[5] has shown that the diffusion coefficient can be calculated from the Portevin–Le Chatelier effect by means of the equation:

$$D_T = 10^{-9}\dot{\varepsilon} \quad (5)$$

where $\dot{\varepsilon}$ is the strain rate at the temperature T at which the effect appears. Since D_0 is always about 10^{-2} cm^2 sec^{-1} for diffusion of interstitials in b.c.c. metals and strain rates used experimentally are generally close to 10^{-4} sec^{-1}:

$$\Delta H = 25{\cdot}3\ kT \quad (6)$$

where k is Boltzmann's constant. The general validity of equation (5) has been demonstrated by Mincher and Sheely[6] and others. Table 1 shows values of ΔH calculated from equation (6). These values, included as squares in Figs. 1–3, agree very well with the values predicted by equations (3) and (4), demonstrating the usefulness of Portevin–Le Chatelier data for predicting activation energies of diffusion for systems for which no direct measurements are available.

Table 1. CALCULATION OF ACTIVATION ENERGIES USING THE COTTRELL EQUATION

Metal	Blue brittleness temperature °C	Ref.	ΔH eV/atom	Interstitial
Cr	300	24	1·26	C
Cr	475	25	1·64	O
W	950	26	2·70	O

The oxygen solubility in a number of transition-metal alloys is related to the electron/atom (e/a) ratio. With $e/a < 5{\cdot}7$, oxygen is soluble, and with $e/a > 5{\cdot}7$ oxygen is insoluble in a range of niobium alloys[7]. Jones *et al.*[8] have shown that the magnetic susceptibility of a number of transition-metal alloys is a minimum at an electron/atom ratio of approximately 5·7, and suggest that either the d-band is split or the density of states curve in the d-band shows a marked minimum at this electron/atom ratio. Bryant[7] has suggested that the vanishing solubility at this concentration can be accounted for on the basis of a Jones–Hume-Rothery mechanism, in which the development of the Fermi surface into a region of k-space in which the density of states is rapidly falling encourages the appearance of a new phase. This explanation is not altogether satisfactory in this case because it fails to explain why oxygen is insoluble in b.c.c. alloys with e/a in excess of 5·7, when the density of states is presumably rising again. This model predicts a solubility minimum at $e/a \simeq 5{\cdot}7$, but not a vanishing solubility at higher concentrations. On the basis of the model, Bryant suggested that oxygen is present as a positive ion in niobium, but this conclusion must be discounted.

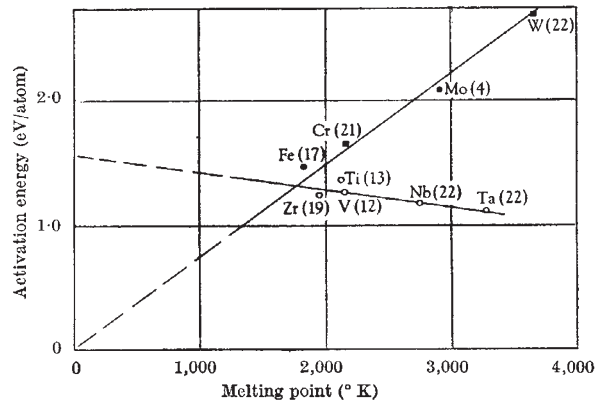

Fig. 1. Variation of activation energy for diffusion of oxygen with the melting-point of the solvent
○, Soluble; ■ ●, insoluble

* Present address: Battelle Memorial Institute, Columbus, Ohio.