constant; Hildebrand's rule that $\gamma = 1$ and A a universal constant. A comparison with experimental data for liquids shows that Hildebrand's rule gives better results than Trouton's, but a rule which gives still better agreement is obtained by putting $\gamma = 1{\cdot}5$, when $\log A_{1{\cdot}5} = 6{\cdot}37$. The vapour pressures of solids, the vapours of which have rigid molecules, are also given by this equation with $\gamma = 1{\cdot}5$ and $\log A = 6{\cdot}9$, but much larger values of A are obtained if the molecules possess internal degrees of freedom. It is therefore assumed that such molecules in the vapour phase may possess high internal mobility, as though liquid, whilst at lower temperatures they may become rigid, as though solid. Such effects probably do not exist with molecules of vapours of liquids. This part of the paper contains a detailed and valuable analysis of experimental data.

The ratio of the latent heat of fusion to the melting point has high values for large molecules such as stearic acid, increasing roughly in proportion to the number of atoms in the molecule, and in such cases a large part of the heat of fusion represents an internal heat of fusion of the molecules themselves, which in the solid are rigidly arranged within the lattice, so that the molecule itself is solid, but when the solid melts the molecule also melts.

In considering the evaporation of adsorbed atoms from an adsorbed film containing σ atoms per unit area, the value of τ, the average life of the adatom, being the same for all, the rate of evaporation (atoms cm.$^{-2}$ sec.$^{-1}$) is

$$\nu = \sigma/\tau = \sigma_1\theta/\tau.$$

From (3) in the form

$$p = A_{1{\cdot}5}T^{\frac{3}{2}}e^{-b/T}$$

where

$$b = b_0 - \frac{3}{2}T = \frac{\lambda}{k} - \frac{3}{2}T,$$

λ being the latent heat of evaporation per atom, and (1) in which $\mu = \nu_1 = \sigma_1/\tau$, we find

$$\tau = (2\pi mk)^{\frac{1}{2}}(A_{1{\cdot}5}T)^{-1}\sigma_1 e^{-b/T},$$

in which it is shown that $A_{1{\cdot}5} \simeq 8 \times 10^6$, and hence

$$\nu = A_{1{\cdot}5}(2\pi mk)^{-\frac{1}{2}}\theta T e^{-b/T}, \quad . \quad . \quad (4)$$

an equation for the rate of evaporation of atoms or molecules from monatomic films on surfaces which is shown to agree reasonably well with experiment for thorium, oxygen, and cæsium films on tungsten. In (4) the forces of interaction between adatoms are taken into account by the value of b, and since b is in general a function of θ, the value of ν is not proportional to θ except at such low values of θ that b is near the limiting value for $\theta = 0$.

Although the conditions in which adsorbed films more than one molecule thick can be formed are rather unusual, they are discussed. In general, adsorbed molecules on plane homogeneous solids are acted upon by strong forces originating from the underlying solid. The adsorbed molecules thus become polarised and repel one another as dipoles with forces proportional to M^2r^{-4} (M = dipole moment; r = distance), and attractive forces predominate only when two kinds of adsorbed molecules are present which become polarised in opposite senses, as cæsium and oxygen on tungsten or salts on metals, such as mercurous sulphate on mercury. In some cases, however, the forces exerted between solid and adatom are small, as when hydrogen molecules or helium atoms strike a chemically saturated surface such as tungsten covered with adsorbed oxygen. In such cases the average life of the adatom is so small that it does not even reach thermal equilibrium with the solid, so that the accommodation coefficient is much less than unity (0·1 – 0·2).

The equation of state of the two-dimensional gas composing the adsorbed film may be found by the virial method with a repulsive force specified in terms of dipoles:

$$FA = RT + \tfrac{1}{2}\Sigma(rf).$$

A two-dimensional van der Waals equation, in which the long-range forces are now repulsive, takes the form

$$(F - a/A^2)(A - A_1) = RT,$$

in which A is the area containing 1 gm. atom and A_1 in the ordinary derivation considering only first order effects is found to be only half the area actually covered by 1 gm. atom of adatoms. Experimental data for oil films at high surface concentrations show that A_1 corresponds with a close packed film in which the molecules cover the surface completely, and a new theoretical derivation for the case of a high concentration of adatoms confirms this.

The choice of a dipole repulsive force for the virial expression is justified by the experimental result that adsorption of alkali metal atoms occurs strongly only when the electron affinity of the adsorbent metal exceeds the ionising potential of the alkali metal. The positive charge on the adatoms causes a change in contact potential by as much as 3 volts and a corresponding increase in electron emission. It is then shown that it is possible to calculate the moments M as functions of θ. In the case of cæsium on tungsten, these vary from 16 debyes for $\theta = 0$ to 6 debyes for $\theta = 0{\cdot}9$. The electron and positive ion emission rates are then calculated and found to be in agreement with experiment. In the first case, the influence of electron spin is taken into account and Dushman's equation, derived from the Sackur-Tetrode relation, is somewhat modified, although probably within the limits of experimental error.

The results on the evaporation of cæsium films are very different from those predicted by the old formula (2), based on the assumption that there are no repulsions between adatoms, but the general results are in agreement with the new equations.

The effect of inhomogeneity of the adsorbing surface, first predicted by Langmuir and since studied experimentally and theoretically by H. S. Taylor and others, is then considered. The importance of the so-called 'active areas' in determining the catalytic properties of surfaces, even plane surfaces, is well known. It is shown, however, that the calculations lead to the result that the tungsten surface is essentially homogeneous, although they indicate that on about 0·5 per cent of the surface the cæsium atoms are much more firmly bound than the rest. The active spots probably consist of isolated elementary surfaces each capable of holding one adatom.

University and Educational Intelligence

CAMBRIDGE.—The Busk studentship in aeronautics, founded in memory of Edward Teshmaker Busk, who lost his life in 1914 whilst flying an experimental aeroplane, has been awarded for the year 1932–33 to Mr. Herbert Brian Squire, of Balliol College, Oxford.

LONDON.—The Coal and Corn and Finance Committee of the Common Council of the Corporation of the City of London has recommended the grant of £100,000 towards the new central buildings of the University which are to be erected in Bloomsbury (see NATURE of July 9, p. 49). At Lord Macmillan's suggestion, the gift of the Corporation will be devoted

to the building of the Great Hall. The grant will be payable over a period of ten years, in annual sums of £10,000, commencing on March 25, 1933, and is conditional on the balance of the cost of the Hall being subscribed, and that the Hall shall be identified permanently and prominently with the Corporation. In a letter to the University, the Lord Mayor expressed the hope that the subscriptions towards the balance will help still further to identify the University with the City.

THE University of London has recently issued a prospectus of twelve courses of university extension lectures to be held during the session 1932–33 at various centres in London. The method adopted in such courses is to follow each lecture with a conversational class. Written work will be set, the submission of which will be optional, but regular attendance, etc., will entitle students to enter for an examination at the end of the course, in connexion with which certificates will be awarded by the University. The courses include the following: twenty-four lectures on "The Psychology of Everyday Life", by Prof. Cyril Burt, at Gresham College; ten lectures on "Religion and Science", by the Rev. S. C. Carpenter, at the Kingsway Hall; twenty-four lectures on "Problems of Society and Government", by Mr. A. Barratt Brown, at the Mary Ward Settlement. The first lecture of each course is free. Further information with regard to these courses of lectures can be obtained from the University Extension Registrar, University of London, South Kensington, London, S.W.7.

THE ninety-first session of the School of Pharmacy of the Pharmaceutical Society of Great Britain will open on Oct. 5, when the inaugural sessional address will be delivered by Dr. C. W. Kimmins, formerly chief inspector in the Education Department of the London County Council.

THE Royal Institute of Public Health has recently issued prospectuses of three courses of lectures and lecture-discussions to be held during the coming winter. The Harben lectures will be delivered on Oct. 10, 11, and 12, at 4 P.M., by Prof. Max Neisser, professor of bacteriology and hygiene at the University of Frankfurt-on-Main, on "Some New Investigations regarding Old Bacteriological Problems". A course of eight lectures, to be delivered by various lecturers, will be given on Wednesdays, commencing Oct. 19, on "Preventive Medicine: The Maintenance of Health and the Avoidance of Disease". Six lecture-discussions have also been arranged to take place on Thursdays, commencing Oct. 27, on "Mental Defectiveness as a Medico-Sociological Problem". All the lectures are free. Further information can be obtained from the Secretary, Royal Institute of Public Health, 23 Queen Square, London, W.C.1.

ERRATUM.—In NATURE of Aug. 27, p. 321, in the title of the thesis for the degree of D.Sc. (Engineering) conferred on Mr. C. E. Larard, the word 'their' should read 'other'.

Calendar of Geographical Exploration

Oct. 2, 1788.—Western Pacific Islands

Capt. John Hunter sailed to the Cape via the Cape Horn route. In 1789 he carried out surveys of parts of the coast of New South Wales and reached Norfolk Island, where his ship was wrecked. In March 1791 he sailed for Batavia and discovered the Stewart Isles and the Lord Howe Archipelago, the latter group being the Ontong Java named by Tasman. After passing the Admiralty group, Hunter discovered and named Phillip Island.

Oct. 5, 1876.—Records of an Arctic Winter

The crew of a vessel built and fitted out by a Russian, Sidoroff, who was interested in arctic navigation, began life in winter quarters at the Briochov Islands in the Yenisei delta, lat. 70° 48′ N. Nummelin, who was in charge of the expedition, with four exiles, kept temperature records from day to day and Nordenskiöld records his results in his account of the voyage of the *Vega*. Nummelin's four companions died of scurvy, but three others later joined him. A relief party came from the south on May 11 and tried to dig the vessel from the snow and ice, but it was again buried by a snowstorm. In mid-June the ice began to melt and the waters rose so high that Nummelin, with five men and two dogs and a small stock of food and fuel, had to pass six days perched on the roof of a hut. Night and day the men poled away the blocks of ice which threatened to crush the hut; on June 25 the water subsided and they were able to climb down.

Oct. 6, 1777.—The Orange River

R. J. Gordon and W. Paterson left Cape Town on a journey in which Gordon reached the Vaal. The two men afterwards made several journeys in different directions, which resulted in the survey of the lower course of the Orange River and in great additions to knowledge of the botany of the region. Paterson was particularly interested in natural history and obtained a valuable collection of South African plants.

Oct. 7, 1844.—From East Coast to North in Australia

Dr. Ludwig Leichhardt started from the Condamine River and reached the Gulf of Carpentaria. Leichhardt's aim was to find a route from the east coast of Australia to the north; in this he was successful, reaching Port Victoria in September of the following year. His journey covered 3000 miles, opened up valuable country, and added much to the knowledge of the orography and drainage of the region through which he passed. Leichhardt met his death two years later in an attempt to cross Australia from east to west.

Oct. 8, 1515.—Estuary of the Plate River

Juan Diaz de Solis sailed from the port of Lepe, reached the Bay of Rio de Janeiro on Jan. 1, 1516, and continuing southwards entered the great estuary of the Rio de la Plata. De Solis reached the north of the Parana River, but was there murdered by Guarani Indians. Sebastian Cabot explored the estuary in 1527 and ascended the Parana to the limit of navigation, the Agipe Falls. A Spanish expedition under Pedro de Mendoza landed in the estuary in 1535 and founded the city of Buenos Aires, but the hostility of the Indians caused the settlement to disappear. In 1541, Cabez de Vaca landed on the island of Sta. Catarina, reached the mainland, and by December 1541 arrived at the Iquassu, a tributary of the Parana, and thence took possession of the Parana for Spain. De Vaca rebuilt the port of Buenos Aires, and on a later expedition up the Paraguay reached the marshy country of Xarayes; he had previously explored the northern shores of the Gulf of Mexico (see Calendar for Aug. 10).