Table 1. VALLEYS MEASURED

River	Size of catchment above measured section of channel (sq. miles)
<i>Thames Basin</i>	
Cherwell	13.3
Coln	13.2
Dikler	4.65
Dorn	13.9
Evenlode	63.2
Glyme	16.85
Leach	21.0
Windrush	6.4
<i>Warwickshire Avon Basin</i>	
Itchen (i)	8.7
Itchen (ii)	23.3
Itchen (iii)	42.3
<i>Herefordshire Wye Basin</i>	
Garren Brook	4.1
<i>Sussex Arun Basin</i>	
Dunsfold Brook	37.0
Kirdford Brook	20.8

streams have suffered a marked reduction of discharge at bank-full stage. The analysis of the results indicates that the reduction has taken place within the limits of the basins as at present defined. River capture is seen to be irrelevant to the question of stream shrinkage. The problem is one of changes in the rate or amount of precipitation, or in both, and possibly also of high surface-discharge from melting snow. This conclusion, already reached on other grounds, is amply supported by the figures analysed here.

G. H. DURY

Department of Geography,
Birkbeck College
(University of London),
London, W.C.1.
March 4.

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³ Flisk, H. N., U.S. War Dept., Mississippi River Commission (1944).
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New Zealand Crustal Structure

A SEISMIC refraction profile 170 km. in length has been recorded in the Wellington Province of the North Island by officers of the Geophysics Division, N.Z. Department of Scientific and Industrial Research. The shot point and all recording stations were sited on basement greywacke. A formal solution of the results shows four layers with thicknesses of 0.6, 1.7, 7.2 and 8.8 km. in which the velocities of longitudinal waves are 3.5₀, 5.5₂, 6.0₇ and 6.2₂ km./sec. respectively. The Mohorovičić discontinuity is at a depth of slightly more than 18 km., and the velocity below it is 8.0₃ km./sec. No reverse shot was possible, and gravity data indicate that the discontinuity may be slightly deeper at the northern end. The true velocities could therefore be a little greater than those given by the formal solution. The Mohorovičić discontinuity and possibly the 6.0₇/6.2₂ boundary are confirmed by reflexions.

The 3.5 km./sec. velocity is not considered to indicate a separate layer, but to represent the weathered and shattered upper portion of the greywacke with which the 5.5 km./sec. velocity is associated. There is probably no sharp transition between these 'layers'. The earlier conclusion of Bullen¹ from earthquake studies that the 'granitic' layer is thin or absent in New Zealand is not accepted, since the 6.0 km./sec. velocity is that conventionally assigned to this layer. Bullen's results can be re-interpreted to conform with this view. It is uncertain

whether the velocity of 6.2 km./sec. is high enough to allow the associated layer to be identified as 'intermediate'.

A detailed account of the observations and discussion of the results will be published later this year as a Memoir of the Geophysics Division of this Department.

G. A. EIBY

Seismological Observatory,
Wellington, W.1,
New Zealand.
Feb. 22.

¹ Bullen, K. E., Proc. Sixth Pacific Sci. Congress, 103 (1939).

The Nocturnal Heat Balance

IT is implicit in the generally accepted theory of the heat balance on clear nights¹⁻³ that the cooling of the air near the ground is a direct consequence of heat loss to the surface by convection and conduction; ultimately the latter. However, Ramdas and Atmanathan⁴ have shown that, in India, under very stable atmospheric conditions, the lowest air temperature is not reached at the surface but at some height above it. This observation is inconsistent with the classical theory. The phenomenon has been observed by workers in other places, notably Brawand and Kohnke⁵ in Indiana, and Jenny⁶ in Lausanne; but apparently its theoretical implications have not been appreciated. Ramanathan and Ramdas⁷, and more recently Rider and Robinson⁸, have suggested that under stable conditions certain air layers near the ground may be in radiative rather than conductive equilibrium with their surroundings, the eddy conductivity approaching the molecular value. Sutton⁹ and others have stated that the part of the atmosphere mainly concerned in nocturnal radiation exchange is a relatively thin layer near the ground. Now if this layer is considered to be at the same initial temperature as the surface it must be a net radiative loser of heat, and will therefore tend to cool to a temperature below that of the surface; a process more or less retarded by heat gained by convection and conduction from the ground and from the upper air layers. On the basis of this theory, the temperature reached by the surface continues to play an important part in determining that reached by the air near it, but for reasons quite different from those given in the classical theory.

The present investigation confirms the observation of Ramdas⁴. Fig. 1 shows the temperature profile observed over the centre of a thirteen-acre field of entirely bare soil. The temperature of the 'surface' was obtained by taking the mean reading of two spirit-in-glass minimum thermometers resting upon it. It is inconceivable, especially in view of Robinson's observations⁸, that the temperature indicated could have been greater than the effective surface temperature under these conditions. The other temperatures were measured with a single type U 2361 thermistor, of diameter about 0.01 in., without aspiration or screening. So small an element indicates closely the behaviour of the air temperature. Moreover, the observed profiles could not be adequately explained in terms of errors due to radiation, evaporation or thermal lag, even if these were appreciable. The shape of the profile was confirmed qualitatively by observations with pairs of fully exposed minimum thermometers. A sensitive wind-direction recorder (vane-centre at 14 in. above the surface) remained