hydrogen was released during the reactor accident at Windscale on October 10 and 11, 1957. Since the samples were taken two days apart, the initial rise in Fig. 1 is not well defined, but obviously the increase began either on October 11 or on October 12. The final rise to full maximum occurred between October 14 and 16. Thereafter the tritium content dropped steadily to its former value, which was reached about October 23.

This peak in tritiated hydrogen coincides well with the mixing pattern observed for the radioactive cloud injected by the Windscale accident, as illustrated by the distribution of the Windscale iodine-131 activity in air. From Figs. 3, 4 and 5 of the paper by Crabtree[3], it can be seen that the cloud arrived in the vicinity of Hamburg on about October 12 and extended farther north-east on subsequent days, giving rise to a continuous increase of the iodine-131 activity in air at Hamburg. No data were reported after October 15. By October 15 the horizontal gradient of the iodine-131 activity was already so small that subsequent horizontal and vertical mixing would be expected to cause a dilution rather than a further increase of activity.

The total amount of tritium released in the form of tritiated hydrogen cannot be estimated but cannot have contributed significantly to the global inventory of tritiated hydrogen, considering that the tritium concentration returned to its former value within 8 days.

Part of the released tritium must have been produced by ternary fission. A production of 0·8 tritium atoms per 10^4 fissions has been reported[4]. Another source is the reaction ^{6}Li(n α)T, due to irradiation of cartridges containing lithium–magnesium alloy which were present in the pile[5].

D. H. Ehhalt
A. E. Bainbridge

National Center for Atmospheric Research,
Boulder, Colorado.

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METEOROLOGY

Estimating Severity of Drought

In central Australia, the red kangaroo, *Megaleia rufa* (Desmarest), breeds continuously during favourable weather when the green herbage, which it prefers to eat[1,2], is abundant; but progressively more and more females become anoestrous during prolonged drought[2–4].

Pastures inhibited by drought respond to falls of rain ranging from about 1·16 in. in January to about 0·29 in. in July, and they respond well should enough rain fall later to keep the soil moist for about 4 weeks[5]. Since water evaporates from the soil about 0·2 times as fast as from a standard evaporimeter, an extra 2·31 in. of rain is needed in January and about 0·58 in. in July[5]. But the climate of the area is arid, the mean annual rainfall and evaporation at Alice Springs being 9·93 in. and 95·18 in. respectively. Therefore, adequate rain to stimulate general growth of pastures is uncommon, and droughts are frequent and often prolonged.

In order to compare droughts in different places and at different times during the course of the investigation of red kangaroos, a formal method of measuring the severity of a drought was needed. The 'drought index' described here served this purpose quite well.

When rain sufficient to cause pastures to respond fell in any month, the index was set to zero. The estimated rate at which moisture evaporates from the soil was then subtracted day by day from the amount of rain that fell, until the remainder reached zero. Throughout that period of time the drought index was kept at zero, that is, any drought experienced in that time was considered to be ineffective. Thereafter, the estimated evaporation from the soil was accumulated day by day to provide a measure of the aridity of a given period. If any rain falling in that time was insufficient to cause a general response in pastures, then the amount falling was subtracted from the index on the day it fell. But, if the rain falling was sufficient, then the index reverted to zero. It was found that the periods during which the index was set at zero corresponded well with the periods during which green herbage was abundant in the countryside. Because the index made allowance for the average drying power of each day in each month, it provided a quantitative estimate of the stress imposed on the physiology of plants, and of animals grazing them.

When the proportions of anoestrous female kangaroos and of the pouch-young which die in the pouch were plotted against the values of the drought index, S-shaped curves resulted[6]. This is the classic response obtained when groups of animals are experimentally exposed to increasing doses of a drug, and the appropriate model for testing this response is the probit analysis[7], which transforms such data so that a linear regression results. Probit analyses of the data for the kangaroos proved to be quite satisfactory. They showed that kangaroos on two areas of central Australia, separated by only 15–20 miles, responded differently ($P < 0·05$) to droughts of the same severity, thus highlighting the different nature of the two areas, as one area was better grassed than the other[6].

The drought index, calculated in this manner, is therefore likely to be a sensitive way of describing the prevailing weather. It would do so more accurately if the actual evaporation of any day or month were to be used instead of the average, but none the less it seems quite satisfactory.

This method of describing the weather is an improvement on older methods which used the ratio of rainfall to evaporation, or some function of it[8–12], because it has a biological foundation (the response of native pastures), allows for the effectiveness of individual falls of rain and the severity of individual droughts, and offers a continuous record from day to day.

A. E. Newsome

Department of Zoology,
University of Adelaide.

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GEOLOGY

Allometric Growth of Ammonoid Shells : a Generalization of the Logarithmic Spiral

The fact that in many ammonoids the shape of the shell is only approximately represented by a logarithmic or equi-angular spiral curve is now fairly well known[1–4]. From the work of Currie[4], it is clear that the spiral angle of the curve traced by the umbilical seam in two species of *Cadoceras* undergoes changes during growth which have a fairly complicated pattern, so that a single continuous mathematical function may not fit any better than would two or more equi-angular spirals having different values of the spiral angle (φ). Moreover, the proportions of the cameral cross-section may vary during growth, with the result that the venter and the umbilical seam will follow different spiral curves. Also, in many ammonoids there