stage, a quick withdrawal of the recording micro-electrode resulted in a fall in the observed potential, indicating that the stationary (or resting) potential of the cell was now reversed. These cells were usually capable of responding to pulses of inwardly directed current with all-or-none action potentials of the reversed polarity (Fig. 1, record 6). In some of these cells, the potential could be switched back and forth between the two stable levels by delivering anodal and cathodal pulses alternately (Fig. 1, record 2).

The experimental results described in this report are regarded as additional evidence in support of the view that action potentials are produced by transition of the state of the membrane between two physico-chemically stable configurations².

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Oestrogens in Pasture

As early as 1926 Dohrn *et al.*¹ discovered the oestrogenic activity of plant material. It was only in 1944 that Bennets² described disorders in sheep originating from oestrogens in pasture with a high content of subterranean clover (var. Dwalganup). Bartlett *et al.*³ suggested that in Britain oestrogens in pasture might raise milk yield and non-fatty solids in the milk of cows.

It is, however, difficult to demonstrate oestrogens in grass by the current method, consisting of extraction of the grass and biological testing of the extracts. With this method we obtained poor results in pasture not containing subterranean clover. Prof. E. Brouwer suggested therefore that the grass should be tested as such with the aid of castrated female rats. In four such experiments we obtained good results.

Every experiment was started with three groups of ten animals three weeks old. Group I received the basal ration only, group II the same ration plus fresh grass, and group III the basal ration plus oestrone. The experiments were performed in July 1958, November 1958, April 1959 and May 1959.

The average uterus weights (mgm./gm. body weight) in groups I and II were as in Table 1.

TABLE 1

Experiment No.	Group I (control)	Group II (grass)	Difference
1 (July 1958)	0.098	0.174	0.076
2 (November 1958)	0.106	0.170	0.064
3 (April 1959)	0.128	0.156	0.028
4 (May 1959)	0.036	0.124	0.088

In all four experiments the difference was highly significant by Wilcoxon's test, even in the autumn grass, *P* being 0.001 in experiments 1, 2 and 4 and 0.004 in experiment 3.

We therefore recommend the above test for studying the oestrogenic activity of feeds more closely.

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² Bennets, H. W., *J. Dep. Agric. W. Austr.*, **21**, 104 (1944).
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PLANT PHYSIOLOGY

Effects of Gibberellic Acid on Juvenility in *Marsilea* and certain other Plants

In addition to the more familiar effects of gibberellic acid, it has recently been found, by several authors, that this substance can affect the duration of the juvenile stages of certain plants. Thus, Robbins¹, discovered that when an arborescent form of ivy (*Hedera canariensis variegata* var. *arborescens*) was supplied with gibberellic acid, branches with completely juvenile characteristics were produced by some of the treated plants. Robbins believed that gibberellic acid is probably comparable with the 'Jugendsubstanz' postulated by Frank and Renner² in explanation of their own observations, and earlier work by Doorenbos³ on the rejuvenation of adult ivy shoots. Scurfield and Moore⁴, however, found that seedlings of *Eucalyptus* species, when treated with gibberellic acid, developed the adult leaf type earlier than the control plants, although Njoku⁵, using seedlings of *Ipomoea caerulea*, obtained a prolongation of the juvenile phase.

In view of these varied findings, it seemed desirable to study the effects of gibberellic acid on sporelings of the water fern *Marsilea*, a plant in which the transition from simple spatulate, followed by bifid, juvenile leaves to the quadrifid adult leaf provides a particularly clear indication of the course of heteroblastic development. In the experiments outlined here, conditions of aseptic culture were adopted because of the fine control they permit of the nutritional status of the plants. Aseptic embryos of *Marsilea drummondii* were obtained by the technique used in previous studies⁶ and transferred to the various culture media. The latter consisted of a basal Knop's medium, with addition of gibberellic acid to give final concentrations of 0, 1.0, 10.0 or 100 mgm./l. A.R. glucose was supplied as an organic carbon source at concentrations of 2 or 4 per cent. The cultures were kept at a constant temperature, 22–24°C., and illuminated by fluorescent tubes giving a light intensity of approximately 150 foot-candles at the level of the cultures. Weekly records were made of leaf number, leaf segmentation, and any other morphological differences observed. Some of the results obtained are summarized in Table 1.

As in the work of other authors, moderate concentrations of gibberellic acid (1.0 and 10.0 mgm./l.) led to some increase in the growth rate of the plants, as shown by the overall size of leaves and rhizome, and the length and degree of branching of the roots; a slight decrease in the rate of leaf production was perhaps related to the greater size of the young leaves and roots of the apical region. At the 100 mgm./l. concentration of gibberellic acid, the roots were markedly stunted and the shoot system somewhat shorter than in the controls.

In the present context, the changes in leaf segmentation represent the most interesting response to the gibberellic acid. It is evident from Table 1

Table 1. EFFECTS OF GIBBERELIC ACID AND OF GLUCOSE CONCENTRATION ON LEAF SEGMENTATION AND LEAF PRODUCTION IN *Marsilea drummondii*

Gibberellic acid concentration in mgm./l.	Mean node of Insertion of first Adult (4-d) Leaf*		Mean number of Leaves per plant after 6 weeks of growth*	
	2% glucose	4% glucose	2% glucose	4% glucose
0	9.33 (6)	5.50 (6)	12.33 (6)	11.67 (6)
1.0	7.40 (5)	—	10.80 (5)	—
10.0	6.20 (5)	5.0 (4)	9.80 (5)	11.25 (4)
100.0	6.40 (5)	5.40 (5)	8.20 (5)	8.20 (5)

* Number of replicate cultures in brackets.