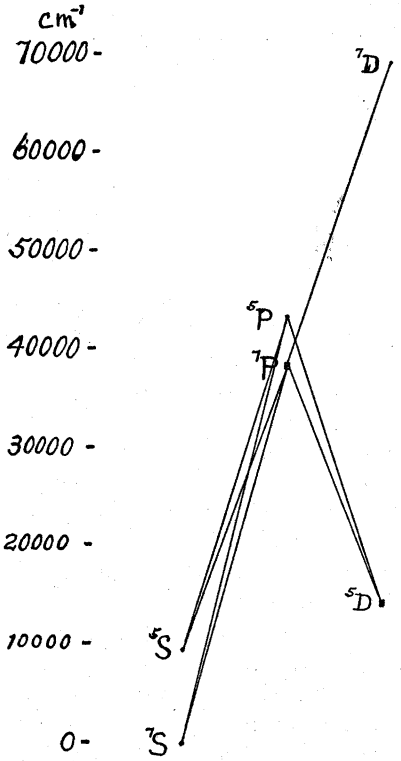
^5P levels (Fig. 1) appeared in the spectrum but none from the ^7D level. When neon was substituted for argon and all other conditions kept the same as before, the $^7P - {}^7D$ lines came out strongly.

This work led us naturally to the analysis of the MnII spectrum. In 1923 Catalan[4] published four multiplet arrangements in the spark spectrum of manganese which can easily be recognized as $^7S - {}^7P$, $^7P - {}^7D$, $^5S - {}^5P$, and $^5D - {}^5P$. The lowest term of the MnII spectrum may be expected to be the ^7S term and so the levels of the septet terms were immediately established, as shown in Fig. 1. Catalan's multiplets



enabled us to determine the relative levels of the quintet system and so the first problem was to find intercombination lines which would fix the positions of the two systems with respect to each other. The difference $^5S - {}^7S$ can be estimated from convergence limits in the MnI spectrum.[5] Dr. O. Laporte, who has given us valuable suggestions on the nature of the MnII spectrum, had recently calculated this difference and furnished us his result, 9,477 cm^{-1}. Using this value, intercombination lines were quickly found which fixed the difference at 9,474.3 cm^{-1} and established the relative positions of the two systems. Lines have been found for the transitions indicated in Fig. 1, and the work of completing the analysis of the spectrum is in progress. The similarity of this spectrum to that of CrI is apparent from a comparison of their diagrams.[6]

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[4] *Phil. Trans. Roy. Soc.* 223, 127, 1923.

[5] McLennan and McLay: *Trans. Roy. Soc. Canada* 20, 15, 1926.

FOG PRECIPITATED BY TREES

THE collection by vegetation of moisture from fog has interested me for a long time. I recently found an opportunity to approximately measure the amount collected by trees.

During the summer west winds blow the moisture-laden air from the Pacific Ocean up and over the hills back of Berkeley, California. Nearly every afternoon fog collects on the hills at elevations above 800 feet and stays until the morning sun dissipates it. Occasionally it remains the entire day.

About twenty-five years ago pine and eucalyptus trees were planted on the sides and tops of the hills over large areas which prior to that time were bare of all but grass. Trees were found only in canyons, while brush covered many of the slopes, particularly those sloping to the north. These trees grew slowly for a number of years but have made very rapid growth in the dry years since 1917. The summers here are nearly rainless and all vegetation on the hills usually dries up during this rainless season, except in protected spots and in canyons where moisture is more plentiful.

I have long noticed that the soil beneath trees is more moist than elsewhere, the additional moisture coming from the collection of water from the fog dripping to the ground. I recently (July 31) collected samples of soil from beneath trees and from ten feet from trees, where soil and other conditions were identical. Samples were collected from surface to 12 inches depth and the moisture determined. Here are the results:

	Percentage of Moisture	
	Under tree	Ten feet from tree
Monterey Pine—Elev. 1,500 ft.	24.4	7.8
Monterey Pine—Elev. 1,600 ft.	28.5	7.7
Eucalyptus —Elev. 1,650 ft.	22.9	9.4

Assuming the weight of soil as 90 lbs. per cubic foot, these differences in percentage are equivalent to the following in inches of rainfall. Pine, elevation 1,500 feet, 2.87 inches. Pine, elevation 1,600 feet, 3.60 inches. Eucalyptus, elevation 1,650 feet, 2.33 inches. The soil was moist much deeper than 12 inches, so the total difference in inches of water collected is much above that shown.

The area of ground covered by trees, where the

[6] Catalan: *Anales Soc. Esp. de Fis. y Quim.* 21, 84, 1923.

stand is full, approximates 25 per cent. of the ground area. The moist spots are under all trees where the wind blows up or over the slopes; in some cases moisture has collected fast enough to form puddles and run down the slopes in rivulets. Away from the trees the ground is dry as it usually is in summer.

The trees average 15 feet in height for pines and 20 for eucalyptus, the trunks from 6 to 10 inches thick. Small trees, brush and grass collect relatively little moisture.

The effect of this additional moisture collected from fogs in the dry season is readily noticed in the rapidity of growth. As the trees become larger their collecting area increases.

THOS. H. MEANS

ACTION CURRENTS FROM MUSCULAR CONTRACTIONS DURING CONSCIOUS PROCESSES[1]

IN the course of investigations on the influence of general muscular relaxation[2] upon the occurrence of various types of conscious processes, we arrived at a fairly uniform result. After a period during which relaxation had been sufficiently advanced and generalized, all the subjects (23) who had been adequately trained as judged by certain tests agreed, under controlled conditions, in giving independent reports that there had been for the time a notable diminution or virtually total disappearance of conscious processes. These included not alone so-called kinesthetic activities but also visual and auditory imagery, attention, reflection and emotion. Extreme relaxation of the muscles of the eyes and of speech seemed of conspicuous importance.

When these subjects were requested to engage in reflection or other conscious activity, but at the same time to seek to relax extremely, they reported that they did one or the other but could not do both. Extreme relaxation was found to be incompatible with the simultaneous presence of conscious activities. When the subjects relaxed extremely to a point where they later reported diminution or absence of mental activity, the muscles of the eyes and face assumed a flaccid appearance which gave characteristic photographs. Association time was greatly prolonged or no associations appeared. The subjects, who were highly trained in observing and critically reporting their sensory experiences, agreed in discerning an experience as of a muscular contraction occurring at the moment of conscious activity and appearing to constitute a part of the conscious process. We are reminded of the assertion of Hughlings Jackson that a motor element is involved in every conscious activity.

To test this conclusion from another direction, we have begun to employ the string galvanometer with vacuum tube amplification. Ours is the first application of that instrument (unpublished in 1921), we believe, to the question whether action currents are given off by muscular contractions associated with imagery, reflection, attention and other conscious processes. Early tests in a preliminary way without amplification on imagined flexion of the biceps brachial group have given positive results. It is necessary, however, to control the methods very carefully and to apply the tests to various parts of the musculature during various types of conscious processes, before the foregoing conclusions can be adequately tested or confirmed. This is now being done.

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[1] Preliminary report.

[2] Jacobson, E. 1924. *Jour. of Nerv. and Mental Dis.*, LX, 568. 1925. *Am. Jour. of Psychol.*, XXXVI, 73.

THE NATIONAL ACADEMY OF SCIENCES

AT the annual meeting of the National Academy of Sciences, held in Urbana, on October 18, 19 and 20, at the University of Illinois, the following papers were presented:

Further evidence on the constancy of the light of stars: JOEL STEBBINS. At the Washburn Observatory, University of Wisconsin, tests of the light of different classes of stars have been made by the writer and C. M. Huffer. From the samples studied it is inferred that white and yellow stars are fairly constant in their radiation, but that the red stars are likely to vary in light, particularly the very red and relatively cool bodies. The amount of the change is often ten or twenty per cent. within two weeks or a month. Nearly one third of the red stars in general, and all of the largest stars like Betelgeuse, are variable in this fashion. It is probable that the surfaces of these stars are covered with spots like those on the sun, and that the bodies are in early stages of development.

An attempt to detect the Einstein displacement at the limb of Jupiter: PHILIP FOX (introduced by Henry Crew). The displacement of star images at the limb of the sun observed at the time of total eclipses has been demonstrated by several observers with values closely approximating the amount predicted by Einstein. On April 28, 1923, Jupiter occulted the star BD–14° 4069. The circumstances of this phenomenon were observed at the Dearborn Observatory. A series of plates were exposed successively as Jupiter approached and receded from the star. This note presents the results of the observations and the plans for a similar occultation which will occur on the evening of December 7, 1927.