11th June 1960
P.O. Box 2
Green Bank
West Virginia, U.S.A.

Dr. R. L. Jones
Physical Laboratory
D. S. I. R.
Lower Hutt, New Zealand

Dear Dr. Jones:

Your article in Nature, 12th March 1960 interests me greatly. I have been performing a rather different experiment onbean vines and hope to have some results soon. There are very few people actively doing work on twining vines. Some time ago I searched the literature and came across the following references which may interest you.

"Klinostat-studies in Twining Vines", H. V. Hendricks,
American Journal of Botony, Vol 27, p 195-198, March 1940

"Torsion Studies in Twining Vines", H. V. Hendricks,
Botonical Gazette, Vol 68, p425-440, December 1919
"   "   Vol 75, p282-297, May 1923

If you have references to other articles where people manipulated the vines and studied the results, I would much appreciate receiving same.

Sincerely yours,

Grote Reber
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only reply consisted of envelope with a reprint which came on 30 June 60

Dr. R.L. Jones
Physical Laboratory
D.S.I.R.
Lower Hutt, New Zealand

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Grote Reber

Nature, 12 March 1960
p 775, No 4715
Vol 185

Plant Physiology

"Response of Growing Plants to a Uniform Daily Rotation"

Dominion Physical Laboratory, D.S.I.R., Lower Hutt, New Zealand

Plants under various fixed conditions of light, temperature and humidity have been turned continuously about a vertical axis at a rate of one revolution per day. The results suggest that the plants used are sensitive to the direction of rotation; a rotation which is clockwise when viewed from above inhibits growth, anticlockwise direction stimulates growth. As the finding may be useful background to a study of the twining of plants, the initial results are being reported.

Cyclamen. In subdued daylight, or in artificial top lighting, plants which were made to rotate clockwise showed, after two or three days, a loss of turgidity in some of the leaves, which yellowed and died as the experiment continued. Plants turned anti-clockwise were as healthy and turgid as stationary ones.

Scarlet Runner Beans. Beans which normally twine anticlockwise were found not to twine around their supports when growing plants and their supports were rotated anticlockwise at one revolution per day under fixed side lighting with tungsten lamps. Plants which were turned clockwise began to twine but lost turgidity, and some leaves yellowed and died. When these plants were transferred at an early stage of reaction to anticlockwise movement they showed partial or full recovery.

<u>Oats</u>. Husked oats (variety Milford) were prechilled in tap water at 5°C for 48 hours. The seed was then sown, groove side down, on moist filter paper in a covered dish, and held at 20°C in darkness. After 24h. germinated seedlings were transplanted on to 4 in diameter perforated plastic holders over tapwater. Each holder and dish (48 seedlings per holder) was transferred to a completely dark, controlled climate cabinet provided with a suitable set of turntables to give clockwise and anticlockwise rotations. Cabinet temperature was controlled to 1°C and relative humidity to 1 percent. In successive experiments the controlled temperatures ranged from 25°C to 28°C and the relative humidity 85-95 percent. After 5 days, the lengths of coleoptiles and roots were measured. In every experiment the mean lengths under each treatment were expressed as a percentage deviation from the mean of the stationary plants. The average deviations throughout nine experiments were as follows.

Clockwise	Coleoptiles	-6.1 percent
	Roots	-8.6 "
Anticlockwise	Coleoptiles	+5.6 "
	Roots	+10.2 "

In individual experiments the means of the clockwise rotated sets of plants were always smaller than those of the stationary, and the anticlockwise in all cases larger (for example, for coleoptiles - clockwise 42.7 ±0.8mm, stationary 46.3 ±0.7mm, anticlockwise 48.2 ±0.9mm) The subject of diurnal rhythms as affecting the above is being considered. R.L. Jones

(*Reprinted from Nature, Vol.* 185, *No.* 4715, *p.* 775 *only, March* 12, 1960)

Response of Growing Plants to a Uniform Daily Rotation

PLANTS under various fixed conditions of light, temperature, and humidity have been turned continuously about a vertical axis at the rate of one revolution a day. The results suggest that the plants used are sensitive to the direction of rotation; a rotation which is clockwise when viewed from above inhibits growth, anti-clockwise direction stimulates growth. As the finding may be useful background to a study of the twining of plants, the initial results are being reported.

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Scarlet Runner Beans. Beans which normally twine anti-clockwise were found not to twine around their supports when growing plants and their supports were rotated anti-clockwise at one revolution a day under fixed side-lighting with tungsten lamps. Plants which were turned clockwise began to twine but lost turgidity, and some leaves yellowed and died. When these plants were transferred at an early stage of reaction to anti-clockwise movement they showed partial or full recovery.

Oats. Husked oats (variety Milford), were pre-chilled in tap-water at 5° C. for 48 hr. The seed was then sown, groove side down, on moist filter paper in a covered dish, and held at 20° C. in darkness. After 24 hr., germinated seedlings were transplanted on to 4-in. diameter perforated plastic holders over tap-water. Each holder and dish (48 seedlings per holder) was transferred to a completely dark, controlled-climate cabinet provided with a suitable set of turntables to give clockwise and anti-clockwise rotations. Cabinet temperature was controlled to 1° C. and relative humidity to 1 per cent. In successive experiments the controlled temperatures ranged from 25° C. to 28° C. and the relative humidity 85–95 per cent. After 5 days, the lengths of coleoptiles and roots were measured. In every experiment the mean lengths under each treatment were expressed as a percentage deviation from the mean of the stationary plants. The average deviations throughout nine experiments were as follows:

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