

From Table 3 we see that out of 25 cases in only 4 cases are δs and δw of the same sign (1882, 1886, 1897, 1901). Hence the probability of the contrary sense in the variations of the August temperature at Nemuro as compared with those of the April pressure at Stykkisholm is 84 per cent, and the probability of their having the same sign is 16 per cent. The author also presents this comparison in graphic form (his Fig. III).

5. *Correlation between the April barometric difference Azores-Iceland, and the August air temperature in northern Japan.*—Inspection of Table 3 shows further that there is a remarkable parallelism between the barometric difference or gradient between Azores and Iceland ($p-s$) in April and the temperature at Nemuro for the following August. Out of the 25 cases given there are 21 in which the signs of δw and $\delta(p-s)$ agree; hence the probability of parallelism is 84 per cent, and that of contrast is 16 per cent.—C. A., jr.

Kristian Birkeland, 1867-1917.

By C. CHREE.

[Reprinted from Nature, London, June 28, 1917, 99: 349.]

We regret to learn from the [London] Morning Post that Prof. Kristian Birkeland, of Christiania, died in Tokyo on June 18, 1917. He was one of the few speculative physicists of the day the value of whose work would be generally admitted in commercial circles. He was the co-inventor with Mr. Sam Eyde of the Birkeland-Eyde direct process for the manufacture of calcium nitrate by the extraction of nitrogen from the atmosphere. In the Journal of the Royal Society of Arts, May, 1912, Mr. E. Kilburn Scott records how, starting with a 25-horsepower experimental plant in 1903, the company controlling the Birkeland-Eyde patents had 200,000 horsepower at work in 1912, and was likely to add a further 300,000 horsepower before the end of 1916. This was by no means the only successful patent in which Prof. Birkeland was interested.

As a theorist Prof. Birkeland was extraordinarily bold in his speculations. He had theories on the internal constitution of the sun and the nature of sun spots; on the sun as a magnet and as a source of electricity;¹ on the origin of the planets and their satellites; on the nature of various celestial phenomena, specially the zodiacal light;² on the production of auroræ and magnetic storms;³ and on the past geological history of the earth. The wealth acquired by his practical gifts enabled Prof. Birkeland to experiment and to arrange for solar and magnetic observations on a large scale. He made many striking experiments with an artificially magnetized terella in a high vacuum, directing toward it electrical discharges intended to represent the discharge of corpuscles from the sun.³ In some of his experiments the vacuum chamber had a capacity of 70 liters and the supply of electrical energy required a 6-horsepower engine. He obtained phenomena closely resembling various forms of aurora, phenomena which he believed to represent the conditions under which magnetic storms appear on the earth.

Prof. Birkeland was largely responsible for the institution of special magnetic observatories in Arctic regions in 1900, in 1902-3, and again during the last few years. His two large volumes in English, "The Norwegian Aurora Polaris Expedition, 1902-3," besides much speculation as to the causes of magnetic storms, contain much important

information as to the simultaneous progress of magnetic disturbance at different parts of the earth.⁴ Since 1910 he had lived a good deal abroad for observational purposes, and numerous communications to the Comptes Rendus of the French Academy of Sciences describe his various conclusions and speculations. In one communication dated July, 1914, he expressed his intention of devoting the next three years to the study of the zodiacal light in Natal, at Helwan, and in Uganda, and he was working in Egypt in 1915 and 1916. Presumably the continuation of his quest had taken him to the Far East. At the time of his death Prof. Birkeland was only about 50 years of age; but when last in England, in 1913, he had aged considerably in appearance and become very deaf. He was, however, as animated as ever when discussing his theories.

USE OF THE DIVINING ROD IN THE SEARCH FOR HIDDEN THINGS.

In the MONTHLY WEATHER REVIEW for March, 1900, the late Prof. Cleveland Abbe published a note drawing attention to the appointment of a French commission, presided over by the engineer Borthier de Rollière, to study all apparatus and methods employed by sorcerers, water seers, etc., who use the divining rod, exploring pendulum, hydroscopic compass, or other fancifully named device. The report of this commission was probably published in 1913, but seems not to have settled the question of the reliability of this kind of device, for it appears that many persons are still successfully persuading the public to employ it.

The literature on the subject of the divining rod is very extensive, and embraces works in one or the other of at least four modern or dead languages, beginning as early as 1532. This literature has recently been well searched and condensed into an interesting publication of the United States Geological Survey,¹ which may be recommended to all who ask, or have to answer, questions about the "discovery" of water, ores, minerals, etc., by occult means. The following is quoted from the introductory note by O. E. Meinzer:

The use of a forked twig, or so-called divining rod, in locating minerals, finding hidden treasure, or detecting criminals is a curious superstition that has been a subject of discussion since the middle of the sixteenth century and still has a strong hold on the popular mind, even in this country, as is shown by the large number of inquiries received each year by the United States Geological Survey as to its efficacy, especially for locating underground water, and the persistent demands that it be made a subject of investigation by the Survey. The bibliography shows that a truly astonishing number of books and pamphlets have been written on the subject. * * * The outline of the history of the subject presented in the following pages will probably enable most honest inquirers to appreciate the practical uselessness of "water witching" and other applications of the divining rod, but those who wish to delve further into the mysteries of the subject are referred to the literature cited in the bibliography, in which they will find reports in painful detail of exhaustive investigations and pseudo-investigations of every phase of the subject and every imaginable explanation of the supposed phenomena.

It is doubtful whether so much investigation and discussion have been bestowed on any other subject with such absolute lack of positive results. It is difficult to see how, for practical purposes, the entire matter could be more thoroughly discredited, and it should be obvious to everyone that further tests by the United States Geological Survey of this so-called "witching" for water, oil, or other minerals would be a misuse of public funds.

A large number of more complicated devices for locating water or other minerals are closely related to the forked twig. A favorite trick for appealing to uneducated persons and yet making specific disproof

¹ This REVIEW, April, 1914, 42: 209 (Abstract).

² This REVIEW, April, 1914, 42: 211 (Quoted); see also footnote 3.

³ Abstract of conclusions in this REVIEW, September, 1916, 44: 508.

⁴ This REVIEW, January, 1909, 37: 16-18.

¹ Ellis, Arthur J. The divining rod, a history of water witching, with a bibliography [and introduction by O. E. Meinzer]. Washington, 1917. 59 p. 4 figs. 8". (U. S. Geol. Surv. Water Supply Paper 416).

impossible is to give as the working principle of such a device some newly discovered and vaguely understood phenomenon, as for example, radioactivity. Many such devices have been in existence since the seventeenth century, and almost without exception the claims that are made for them are very great. If any genuine instrument were invented, its merits would no doubt in time become well recognized, as have those of other real inventions. The magnetic needle used in detecting iron ore is, of course, not included in this category of spurious instruments.

It is by no means true that all persons using a forked twig or some other device for locating water or other minerals are intentional deceivers. Some of them are doubtless men of good character and benevolent intentions. However, as anything that can be deeply veiled in mystery affords a good opportunity for swindlers, there can be no reasonable doubt that many of the large group of professional finders of water, oil, or other minerals who take pay for their "services" or for the sale of their "instruments" are deliberately defrauding the people, and that the total amount of money they obtain is large.

To all inquiries the United States Geological Survey therefore gives the advice not to spend any money for the services of any "water witch" or for the use or purchase of any machine or instrument devised for locating underground water or other minerals.

DESICCATION OF AFRICA.

[Nature, London, June 23, 1917, 99: 352.]

The journal of the East Africa and Uganda Natural History Society (v. 6, no. 11) contains an interesting paper by R. L. Harger on the desiccation of Africa. Reviewing the records on this theme by pioneers like Livingstone, Harris, and Selous, the author adds much valuable matter of his own covering a vast extent of country from Tanganyika southward and westward. There can be no question [says the reviewer in Nature] that the diminution of the chain of the great lakes and the river systems feeding them is proceeding at a most disconcerting rate, but the author makes no suggestion as to the causes to which this shrinkage is due.

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EFFECT OF HUMIDIFICATION OF A SCHOOL ROOM ON INTELLECTUAL PROGRESS OF THE PUPILS.

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[Condensed from Science, New York, June 2, 1917, 5: 657-660.]

Two divisions of a sixth grade of 43 pupils each who were of equal initial ability were treated alike in every respect save the dryness of the school room so far as was possible.

The experiment began on December 4, [1916?]. From then until March 30 the "dry" group did their school work for from four to five hours on five days of the week in a room without any humidification whose relative humidity averaged about 28.7 per cent. The "moist" group during the same period worked in a room of approximately 42.2 per cent relative humidity. The two groups were treated alike in respect to curriculum, teaching, and all other physical conditions of the air than moisture. Two teachers divided the work of teaching, one teaching certain subjects to both classes. The temperature was kept alike for both groups, averaging about 67.4° F. The rooms themselves were alike, the "moist" group beginning in room X which was then humidified by means of an air washer and changing at the middle of the period to room Y which was then humidified. The "dry" group began in room Y, kept as dry as the weather allowed, and changed at the middle of the period to room X, which in turn was then kept dry.

The ventilation of both rooms was controlled in all its details by the staff and plant of the New York State Ventilation Commission, the two schoolrooms having been specially built for experimental work. A full report of the detailed conditions during the experiment will appear later in the report of the commission. For our present purpose it may be accepted that the air conditions for the two groups differed only in dryness, and that the other conditions differed only by chance occurrences, apparently of little or no consequence.

The two groups were tested on December 4 and 5 and again on March 28, 29 and 30, with the following tests, taking in all about 7½ hours of each pupil's time on each occasion. * * * Each pupil was given as a measure of gain in each test the difference between his score in the December test and his score in the same or similar test of March. These gains measure, roughly for each individual and accurately for the group, the increased knowledge and power which has accrued during the time of subjection to the dry and wet conditions.

When the gains in all the tests are combined so as to give approximately equal weight to each, * * * it appears that the "dry" group makes a trifle better showing. Their superiority is, however, no greater than its probable error, and is only one seventh or eighth (according as medians or averages are used) of the mean square deviation of the group in improvement. So far as this experiment goes, then, we find no demonstrable effect of relative humidity on the intellectual progress of school children. What slight difference there is favors the dry condition.

This same substantial lack of difference is found when the gains of the two groups are compared in each test singly. * * * The "dry" group shows more improvement in 9 tests, the "moist" group in 7, with equality in 3 tests. That the two groups were really of equal initial ability is shown by Table III (not reprinted) [which brings out] the superiority of the "dry" group—

By averages	0.79 ± 0.79
By medians	0.7 ± 1.0

It may be noted that an extensive series of observations of young women, made by the commission, with still more rigorous equalization of all influences save humidity, showed a result like that reported here for school children.¹ It may be noted also that physical examinations of the children at the beginning and end of the period showed similarly no demonstrable effect of the difference in air conditions, certainly none in favor of the humidified room. It appears unlikely, therefore, that the humidification of schoolrooms during winter will be productive of any improvement in their mental work.

The influence of humidity on comfort, health, and all forms of activity makes all researches such as the above, of general interest. While the brief communication here condensed concludes that humidification of schoolrooms during winter is unlikely to produce improvement in mental work, and this is an interesting result for the psychologist, yet it does not permit the heating engineer to conclude that the actual humidification there employed was without influence on the bodily comfort of the pupils. Perhaps this point will be treated of in the complete re-

¹ The psychological results of this study are reported in L. J. Stecher: The effect of humidity on nervousness and on general efficiency, *Archives of Psychology*, No. 38. Dec., 1916.