

VARIATIONS IN THE EARTH'S MAGNETIC FIELD

OBSERVATIONS made in a tent on the lake shore in Mackinac County, Mich., during the last month have fully verified the results and conclusions published in my paper entitled "Local Magnetic Storms."

Cloud shadows diminish the permeability of the space within them in precisely the same way that the earth's shadow does at night. The molecules of air are ionized by solar radiation. They are then little magnets, which tend to set along the lines of force of the earth's field, in such a way as to add their magnetic effect to that of the earth's field. When solar radiation is cut off, the air molecules begin to return to their normal condition. Wind gusts and falling rain drops assist in this operation. They decrease the permeability.

When an iron bar is placed within a coil of wire carrying a current, its molecules are not quite so free to set in positions such that their magnetic effect is added to that of the coil. A blow from a wooden mallet then assists them. Its effect is directly the opposite of that produced by a gust of wind in air.

These results appear to furnish a rational explanation of the conditions which bring about local, daily and annual variations in the earth's magnetic field. Local variations are due to local variations in the weather. Clouds and sunshine, wind storms and rain, are the agents which bring about a continual swaying of the lines of force.

They also indicate an explanation of what causes the difference in permeability of solid matter.

In this work the needle was enclosed in an airtight case, and mounted on a silk fiber about 40 cm. in length. Its motion was damped. It was deflected at right angles to the magnetic meridian by magnets whose axes were at an angle of 45° with the meridian. The resultant field was partly compensated by bar magnets 120 cm. in length. All magnets were sealed within heavy rubber tubing, mounted in U-shaped supports, and enclosed in ice. The supporting table was a frame made of 2×4 inch timber, bolted together with brass bolts, and the legs of the structure were set two feet

into solid clay and gravel soil. The frame was securely braced.

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EXCUSING CLASS ABSENCES IN COLLEGE

THERE is no general uniformity in the matter of handling class absences in college. In some institutions the individual teachers still excuse for all absences in the course for which the teacher is responsible. In an increasing number of institutions the excusing power is centralized in some one office and in a large number of cases some form of the cut system is used. In some cases the student is allowed as many absences a semester from a course as the course recites times per week, that is, three absences from a three-hour course, four from a four-hour course, etc. In general the number of class cuts allowed seems to run as a minimum about 15 a semester—the number of absences allowed a semester in all courses approximating the number of recitation periods per week.

In cases where this minimum *is* allowed it means that $5\frac{1}{2}$ per cent, approximately, of the class-room periods may be omitted by any or all students without any account being given for the absences.

A system such as this seems almost an invitation to a student to avail himself of the number of cuts allowed and in a large number of cases is so regarded.

In Oberlin College all class absences are reported to the dean of men and the dean of women, respectively. Each student must give an account to the proper officer of *all* absences.

The results during the semester ending in February, 1913, were as follows in the case of the college men: the average number of absences for each freshman was 6.1, for each sophomore 7.9, for each junior 7.5, for each senior 7.3. This includes absences for *all* reasons, sickness, absence on athletic teams, glee clubs, etc., and counts absences from *all* classes, including physical training. The record of no student is included who left college for any reason before the end of the semester.

The total number of men and absences were as follows during the semester just closed:

	Men	Total Absences	Average Absences per Man
Freshmen.....	115	702	6.1
Sophomore....	81	662	7.9
Junior.....	83	623	7.5
Senior.....	79	580	7.3
	358	2,567	7.17

Of this total number of absences 431 were due to athletics. This includes not alone the absences of the members of teams, but also of students absent to attend games. This number amounts to 17 per cent. of all the absences, but is less than one half of one per cent. of the total number of class periods involved.

795 of the absences were due to sickness, or were so reported. These figures do not attempt to go back of the reasons given for failure to attend class. *At least* 795 absences were so accounted for. It is quite possible that the number should be larger and that the reason was not in every case noted in the record book. This number is 31 per cent. of the whole number of absences, and added to the 17 per cent. caused by athletics accounts for 48 per cent. of the whole number. Of the absences, 52 per cent., or an average of 3.7 per man, were accounted for by various other excuses.

In the practical handling of the excuses, upper-class men are excused without much question as to the quality of the excuse if the number of absences for the semester has not exceeded six to eight. If the number of hours per week for each man is estimated at 15, a normal amount, the total number of absences would amount to 2.6 per cent. of the class periods involved. Or, looking at it in another way, the average attendance of the men for the semester is 97.4 per cent.

The figures from which these percentages are derived are as follows:

$$\frac{\text{Men}}{358} \times \frac{\text{Classes per week}}{15} \times \frac{\text{Week per semester}}{18} = 96.660$$

$$\text{Total number of absences} = 2,567$$

$$\text{Percentage of absences, 2.6 per cent.}$$

If 15 cuts a semester is somewhere near the number usually allowed the following figures

are of interest: of the 115 freshmen 103, or 90 per cent., had *less* than 15 absences; of the 81 sophomores 66, or 81 per cent., had *less* than 15 absences; of the 83 juniors 74, or 89 per cent., had *less* than 15 absences; of the 79 seniors 68, or 86 per cent., had *less* than 15 absences.

The writer submits these figures that they may be compared with the results in other institutions, especially those where some form of the cut system is in use. It is the feeling of the writer that the fact that *each* absence has to be accounted for acts as a deterrent in a large number of cases, when the student would easily absent himself under the cut system.

Each instructor is furnished with blanks and is asked to report the absences for each day. These blanks are deposited in boxes adjacent to the classroom and are collected and entered in the record by a clerk. The scheme to be effective must enlist the support and cooperation of all instructors. The instructors must, of course, attempt to see that all absences are reported. The figures given are for absences actually reported. It is recognized that, owing to human frailty, a certain number are not reported. That same lack exists in any system that has yet been devised. The percentage of absences not reported is, I believe, small. May we have figures from other institutions? The figures I have given here would seem to indicate that a smaller number of cuts might prove feasible in those institutions that use the cut system.

I doubt if we have any scientific basis for estimating the number of excuses that a man is normally entitled to receive during a semester. Perhaps some figures of this kind will give us a start toward such a basis.

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OBERLIN COLLEGE

SCIENTIFIC BOOKS

The Infancy of Animals. By W. P. PYCRAFT. With 64 Plates on art paper and numerous Illustrations in the text. New York, Henry Holt and Company. 1913. Pp. xiv + 272. It would be difficult to find a more fasci-