ferent growth intensities . . . while the disposition and orientation of the follicle in relation to the general growth gradients would affect the direction and magnitude of the forces at play."

It will be admitted that much yet remains to be gained before a complete understanding of the spiral habit is forthcoming, in both its general and particular manifestations. That the crimping of wool represents a periodicity of reversals of rotation, due to a like succession of twists on a fundamental spirality, by no means suggests a simplicity in nature's methods.

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THE TIME CONSTANT

SERIOUS misinformation regarding inductive circuits, contained in a recently published text-book on college physics, appears to justify my calling attention to the facts of the case.

In a circuit containing electromotive force, resistance and inductance the fundamental equation

$$e = ri + l\frac{di}{dt}$$

leads to the Helmholtz equation

$$i = \frac{e}{r}\left(1 - \epsilon^{-\frac{r}{l}t}\right) = i_o\left(1 - \epsilon^{-\frac{r}{l}t}\right)$$

i being the value of the current at the end of t seconds, and i_o the final value. From this it follows that the rate of rise of the current,

$$\frac{di}{dt} = \frac{r}{l}i_o\epsilon^{-\frac{r}{l}t} = \frac{r}{l}\left(i_o - i\right)$$

At the very start, at the moment the circuit is closed, and before the current has an assignable value, we may say $i = o$, and hence at the start

$$\frac{di}{dt} = \frac{r}{l}i_o.$$

Evidently, if this rate of increase should be maintained for $\frac{l}{r}$ seconds the current would reach its final value i_o. This ratio $\frac{l}{r}$, generally called the time constant, is therefore numerically equal to the number of seconds required for the current in reaching its final value if the initial rate of rise should be maintained. This way of regarding the time constant I do not find in any of my books, but I have found it helpful in my teaching experience. Obviously, with a fixed inductance and a fixed ratio between e and r so that i_o is fixed, the rate of rise of current increases as r increases. The curves in the text-book referred to teach exactly the reverse of this truth.

Similarly, in a circuit containing electromotive force, resistance and capacity the fundamental equation

$$e = ri + \frac{q}{c},$$

q being the charge in the condenser of capacity c, leads to the charge q at the end of t seconds

$$q = q_o\left(1 - \epsilon^{-\frac{t}{cr}}\right),$$

q_o being the final charge.

The rate of increase of q, in other words the current flowing into the condenser, is

$$\frac{dq}{dt} = \frac{q_o}{cr}\epsilon^{-\frac{t}{cr}}$$

which becomes $\frac{q_o}{cr}$ at the very start when $t = o$. Obviously, this rate of charging, if continued for cr seconds, would give the condenser its final maximum charge q_o. So here the time constant cr may be defined numerically as the number of seconds in which the condenser would receive its final charge, in case the initial rate of charging should be maintained.

The accurate calculation and plotting of the growth of current in an inductive circuit is rather laborious, but an approximate graph may be easily and rapidly plotted by a method given by C. V. Drysdale in his "Foundations of Alternating Current Theory."

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"'GUNS' OF SENECA LAKE"

"SILENCING the 'Guns' of Seneca Lake" was the title of a discussion which appeared in SCIENCE for April 13, (page 340), having been communicated by Professor Herman L. Fairchild, of the University of Rochester. In it Professor Fairchild offered an explanation of a mystery of sound which, as he states, "has hovered over Seneca Lake, in central New York, for more than a century." This is what is known by the local residents as the "lake guns," an occasional low, dull boom suggesting a distant muffled explosion.

The explanation offered in Professor Fairchild's communication was that Seneca Lake occupies the upper part of a glacially deepened valley which cuts the Oriskany Sandstone at a depth of about 1,450 feet below the surface of the lake, and that the "lake guns" are caused by volumes of natural gas which escape from that porous gas-bearing stratum, find their way upward through the 450 feet of superincumbent glacial drift and ascend rapidly through the