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Changing a Right-thread Helix into a Left or Vice-versa; with Demonstration.

JOHN AUER.

From the Department of Pharmacology of St. Louis University School of Medicine.

In an earlier note[1] it was stated that free sections of fibrin filament were observed moving slowly forward and backward over the face of a red corpuscle without turning around; that fibrin filaments exhibited occasionally a faint diagonal striation indicating a left or right screw-thread; that the same filament showed at one time apparently a left thread and at another a right thread or vice versa; and also that a microcyte touching a red corpuscle at the point of attachment of an actively motile fibrin filament or flagellum, moved slowly first in one direction and then in the opposite direction. This reversal of direction in movement can be explained readily by utilizing the observation that a left helicoid apparently changed into a right helicoid, for with a given rotational direction, either right or left, the helicoid moves in one direction in a resistant medium when it possesses a left twist and in the opposite direction when the twist is right-handed.

That a right helix can change into a left or vice versa may be demonstrated easily in a model. If about 6 turns are cut from a small spool of spring-brass wire (B & S 19) a helix, generally right twist, will be secured. If the ends of this helix are firmly held in pin-vises, the coils moderately stretched apart and the helix rotated so that one end rotates slightly faster than the other, then a change of screw-thread will occur if the rotation is such that the coils widen and decrease in number. For example, in a wire helix with a right-hand spiral and rotating to the right (clockwise) under the conditions mentioned above, the change of twist generally shows itself first in one or the other terminal loop. This terminal loop suddenly exhibits a *left* twist and is connected to the rest of the helix which is still right twist, by a curved U shaped section (Node of reversal). On continuing the original rotation the node of reversal travels away from its site of formation and the number of loops with a left twist increases until the entire helix has changed its spirality. Now the originally right-handed helix rotating to the right has been changed to a *left*-handed spiral rotating to the right

[1] Auer, J., PROC. SOC. EXP. BIOL. AND MED., 1930, **27**, 618.

(clockwise). It is clear that such a process must bring about a 180° change in the direction of travel.

If, on the other hand, the rotation of the helix is such that the number of loops increases and their diameter decreases, then sooner or later a complicated spherical skein or series of skeins is formed. This latter process is apparently active in the production of beaded fibrin filaments described and figured previously.[2]

This mechanism of changing a right helix into a left or vice versa has never been described to my knowledge. The whole process may be followed with comparative ease in a wire model and will be described and figured more fully in a final paper.

Helicoid structures are exceedingly common in nature, animate as well as inanimate; they may be microscopically small as in unicellular organisms or the tissues of plants and animals[3]; readily perceptible to the unaided eye as in tree-trunks, and climbing plants or tendrils (See Fig. 1); or they may be infinitely large, as in the whirling spiral nebulae of stellar space.

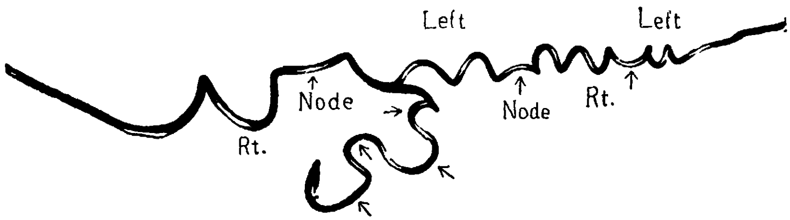

FIG. 1.
Grapevine tendril. Nodes of reversal are marked with arrows. L = left spiral. R = right spiral. Note change of twist after each node of reversal; also the series of 4 consecutive nodes.

If one assumes that all motion, molar, molecular and sub-molecular is helicoid, a number of processes become more accessible to our understanding. For example, the deviation of polarized light by optically active substances; the change of levo-compounds into dextro or racemic forms; the striking difference in physiological activity exhibited by levo and dextro forms, all appear to be explicable on this basis. In the final paper these aspects will be developed more fully.

[2] Auer, J., loc. cit., 619.

[3] Auer, J., PROC. SOC. EXP. BIOL. AND MED., 1926, **23**, 379. See figure illustrating the article.