of twisted trees on the edge of forested areas rather than within them.

The supposed influence of position as related to the sun and to prevailing winds has suggested that if the right twist is more common in the northern hemisphere, as the results would indicate, the left twist should be more common in the southern.

Twisting in vines and their tendrils is familiar to all; the direction of the twist is, I believe, quite constant for any species. Different trophisms have been thought to be the cause, and a frequent experiment is to determine the effect of rotation of the plant in different axes on the twisting.

It may not be known to many that a similar phenomenon has been noted in lower forms of plant life. Boas[1] described and pictured a symmetrical bending of the filaments of a colony of *Oidium lactis* growing on agar. He stated that he has also noted the same symmetrical bending of the hyphae in the case of the molds, *Penicillium brevicaule* and *Rhizopus nigricans*. He believes the spiral-like growth is widespread among the fungi.

The bending of the threads, consisting of a number of parallel rows of cells, of the bacterium variously known as *Bacillus mycoides* or *Bacillus ramosus*, is a striking example of what seems to be comparable to the twisting in higher plants. This organism, when seeded at one point on the surface of a disc of agar, spreads out uniformly in all directions. The appearance to the eye is that of a tangled mass of threads, the main branches of which bend in a uniform direction. The bending of the threads in the various strains which the writer has isolated is counter clockwise. Strains have been described by European bacteriologists in which the bending is to the right and others are what might be called neutral, the bending being neither to the left nor to the righ in an apparent manner. These various forms are thought to be identical in other respects, as determined by the usual methods of the bacteriological laboratory, including the antibody reactions.

The factors, wind, sunlight, etc., which have been invoked to explain the twisting of higher plants, do not enter here. Several have studied the effect of position on the bending and have noted no effects. The writer, following the lead of the botanists, has observed the effect of rotation of the culture during its growth. The constant rotation of the culture on a horizontal axis parallel to the surface of the substratum exerts no influence on the appearance of the growth, nor does rotation on a vertical axis at a right angle to the surface of the substratum, while rotation on an horizontal axis at a right angle to the surface of the substratum causes such a lack of symmetry as to be recognizable by observers ignorant of the conditions existing during growth. The distortion is noticeable not only in lack of symmetry but in the breadth of the threads. The distortion is most marked when the rotation is in the same direction as the normal bending of the threads, that is, counter clockwise.

If the bending of the threads of the bacterium is comparable to the twisting of vines and trees, the lower organism offers many opportunities to the student to measure the effect of this and that factor and possibly to discover a more adequate explanation than those yet presented. The writer, for example, is attempting to find what may be the effect of growing the organism in the southern hemisphere through the aid of a friend in Australia.

It is possible to obtain a growth in which the bending is not present, by using a medium which is less firm than the usual agar of the laboratory. Changing the type of growth does not, of course, offer any explanation for the usual bending of the threads in a definite direction. One writer has spoken of biological isomerisms, the three forms of the organism being comparable to the left, right, and inactive compounds as regards polarized light. Variation in the spacial arrangement within the cell may be a common occurrence. It may account for the type of optical activity of the compounds formed by organisms.

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[1] *Zentb. f. Bakt.*, II, 49, 412. 1918.

METEORITES IN SEDIMENTARY ROCKS?

FOR many years I have searched for meteorites or meteoritic material in sedimentary rocks. About fifteen years ago, one of my students found a meteorite in a bed of gypsum in western Oklahoma. At first, it was thought that the occurrence represented a fall at the time of the deposition of the gypsum, which is Permian in age. A careful study of the occurrence of the meteorite, however, proved that it was evidently recent. I have interviewed the late Dr. G. P. Merrill, of the U. S. National Museum, and Dr. G. T. Prior, of the British National History Museum, both well-known students of meteorites, and neither man knew of a single occurrence of a meteorite in sedimentary rocks. Dr. Prior knew of a meteorite that was found in recent stream gravels but of none occurring in sediments of past geologic periods.

This letter is a petition for any information indicating that meteorites do occur in the sediments. Dr. Merrill was of the opinion that we should not expect to find them in the sediments because they would decompose before they could be buried. Although we may admit that the iron-nickel meteorites might

undergo rapid oxidation under the conditions of weathering on the land surface and the stony meteorites at a slower pace, if a meteorite of any type fell in a sea in which muds or limestones were accumulating, why should it not be buried in these sediments? We know that many of the minerals of the stony meteorites are similar to those of the terrestrial rocks and that the minerals of the latter may be buried without undergoing decomposition. We find arkosic rocks and graywackes (which contain minerals that under normal weathering conditions decompose entirely) that have been buried and constitute integral parts of sedimentary rocks.

An iron meteorite falling in sea water would be rapidly attacked (unless quickly buried) and the exterior converted into iron oxides which would protect the inner portion, in some degree at least, from complete alteration. Even if such a meteorite were completely altered to iron oxides, these should remain as a type of pseudomorph of the original meteorite. Unless the nickel which normally occurs in iron meteorites were all removed during the oxidation, its presence in the resulting ferruginous mass might be taken as evidence of the meteoritic origin of the mass. I have never found any material which suggested that it was of this origin or which seemed to merit being tested for nickel. It is equally difficult to believe that a stony meteorite, falling in a soft mud or calcareous ooze would not be buried before decomposition took place.

The presence of meteoric material in deep-sea muds has little real bearing on the question, as this material may be recent. It is in the possible occurrence of meteorites in the ancient sediments that I am interested. I will appreciate any information any one may have regarding this interesting quest.

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POSSIBLE RELATION OF AGE AT SEXUAL MATURITY IN BIRDS TO DAILY PERIOD, INTENSITY AND WAVE-LENGTH OF LIGHT

IN a recent paper, Riddle[1] shows that, in pigeons and doves, age at first sexual maturity is hastened if the bird reaches an age of 4 to 5 months between February 1 and July 31, and is delayed if this age is reached in autumn. The delay may reach 36 per cent. in pigeons and 52 per cent. in doves. This is brought about by endocrine conditions (thyroid and perhaps pituitary) connected with this part of the year. Earlier studies had shown that the season of accelerated sexual maturity is also the season when, even in mature birds, thyroid size and activity is decreasing. He found a seasonal factor in practically all aspects of sex and reproduction studied in doves and pigeons.

Rowan[2] shows that the seasonal changes of the gonads and occurrence of sexual maturity in the junco, with a single seasonal sexual cycle, is conditioned by length of daily period of illumination. He thinks the change of light period does not act *per se* but by prolonging or shortening the daily periods of muscular exercise. He has since come to the conclusion that this relation holds also for the crow in Alberta, Canada.[3] He altered the sexual cycle in the junco and crow by artificially lengthening or shortening the daily period of illumination for the birds. This is related to the changes of the sex glands and through them or with them to migration in these birds.

The writer[4,5] has reported the close relation of attainment of sexual maturity in the European starling in Hartford, Connecticut, (with single seasonal cycle) to the daily period of illumination, whether of natural or artificial light. This is not caused by changes of periods of muscular exercise in the starling as claimed for the junco by Rowan. However, increased periods of muscular work were found to prolong the refractory period before light-induced testis changes appear and perhaps to increase the rate of acceleration of changes once begun as the result of light change.

In a later study,[6] it is shown that light intensity is a factor in the induction of sexual maturity in the starling, when the periods of daily light are equal. Up to a certain light intensity, rate of acceleration of germ-cell activity, induced by added light treatments of equal duration, varies with the light intensity. Increase of daily period of illumination, even with low intensity of added electric light will induce sexual maturity in both first-year birds and those over a year old and sexually mature at least once before. This may be brought about even in midwinter at midwinter temperature. Sexual ma-

[1] O. Riddle, "Studies on the Physiology of Reproduction in Birds. XXIX. Season of Origin as a Determiner of Age at which Birds Become Sexually Mature." *Am. Jour. Physiol.*, 97 (4): 581–587, 1931.

[2] Wm. Rowan, "Experiments on Bird Migration. I. Manipulation of the Reproductive Cycle: Seasonal Histological Changes in the Gonads," *Proc. Boston Soc. Nat. Hist.*, 39: 151–208, 1931. See list there.

[3] Article in *New York Times*, July 21, 1931, "To Use 1,000 Crows in Evolution Tests, etc."

[4] T. H. Bissonnette, "Studies on the Sexual Cycle in Birds. I. Sexual Maturity, Its Modification and Possible Control in the European Starling (*Sturnus vulgaris*): a General Statement," *Am. Jour. Anat.*, 45: 289–305, 1930.

[5] T. H. Bissonnette, "Studies on the Sexual Cycle in Birds. IV. Experimental Modification of the Sexual Cycle in Males of the European Starling (*Sturnus vulgaris*) by Changes in the Daily Period of Illumination and of Muscular Work," *J. E. Z.*, 58: 281–319, 1931a.

[6] T. H. Bissonnette, "Studies on the Sexual Cycle in Birds. V. Effects of Light of Different Intensities upon the Testis Activity of the European Starling (*Sturnus vulgaris*)," *Phys. Zool.* in press, 1931b.