Twisting was not observed on the western slopes mainly because we were not stationed near these regions. It is likely that the same conditions would prevail there since the storms retained their same relative positions as on the eastern slopes.

Twisting of trees other than those at timberline has been observed and noted but not studied to any great extent. Apple trees are usually twisted in the prairie regions, but no definite set to the twist was noticed. It often occurred that both left and right twisting could be found in the same tree. In cutting up an old orchard that had died we found many trees of this type.

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THE GROWTH OF STALACTITES

AN occurrence, similar to that discussed by Professor Ellis in SCIENCE for January 16, 1931, "Concerning the Rate of Formation of Stalactites," came to my notice during an inspection of Fort Delaware in the summer of 1929.

Fort Delaware is situated on Pea Patch Island, in the middle of the Delaware River, 12 miles below Wilmington and is of the pre-Civil War type with walls of gray granite and interior finish of high grade brickwork. Though started in 1848, it was not completed until after the Civil War.[1] Thus the setting is similar to that at Fort Pickens.

Abundant growths of stalactites were found in process of development from the brick arches on many of the lower casements, the material for their growth being supplied mainly from the lime-natural cement-sand mortar but perhaps to a slight extent from the bricks, which showed some spalling due to water action. These stalactites varied as to type, many being of the slender, fragile variety described by Professor Ellis, with the larger ones reaching over a foot in length, while others were much stouter, with a length of four to five inches and a diameter of over one half inch, and were therefore strong enough to be readily collected. They consisted of a pure white carbonate of lime. Lime deposits also covered the floors of these casements to a considerable extent and in a few cases the development of stalagmites was beginning to be noticeable. Deposition was still in active progress.

As Fort Delaware had already become practically obsolete by the time it was completed, deposition may have been going on undisturbed for as long a period as 60 years. On the other hand, as there was some activity at the fort during the Spanish-American War, 30 years may be set as the lower limit available for the growth of the longer stalactites.

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[1] Charles H. Roe, "The Building of Fort Delaware," *The Military Engineer*, Vol. 21, pp. 350–354, July–August, 1929.

A CASE OF A BOY POSSESSING AN AUTOMATIC DIRECTIONAL ORIENTATION

IN a note in the *Psychological Bulletin*[1] twenty-two years ago H. C. Warren described the case of a boy who had an extraordinarily good sense of direction. A few months ago I wrote to this individual and asked him several questions about his sense of orientation. The answers received were all in the negative —that is, the individual disclaimed that he possessed any different sense of orientation than the ordinary person has who uses familiar objects or the sun as a guide. Whatever ability at orientation this individual had as a boy he has obviously lost as a man.

Recently a married couple who attended one of my classes reported that their son possessed an unusual sense of orientation to the points of the compass. He never seemed to get lost, they said, and when in a strange city could be relied upon to tell them in which direction they were going. While driving in an automobile through unfamiliar country he was able to tell the direction at any time.

With the cooperation of the parents I tested the boy in our psychological laboratory. I took him into a dark room, blindfolded him and confused him by revolving him (without, however, making him dizzy) in a noiseless rotating chair. After a few correct judgments he began to make large errors, and soon lost all absolute orientation. He oriented himself immediately as soon as he was permitted to see.

I convinced myself that he possessed no genuine "magnetic" sense of direction. This finding was corroborated by a story of his parents to the effect that if he went to sleep while riding in an automobile at night he was temporarily lost as to directions when he awoke. Regardless, however, of his lack of a sense of absolute orientation, it is exceedingly interesting that once he gains a true orientation during his waking hours he seems to remain oriented at all times. I might add that he is twelve years of age, above the average in intelligence and curious about everything that goes on around him.

His mother furnished an interesting bit of information on the origin of the development of this sense of orientation. As she is left-handed and frequently confuses "to the right" with "to the left," she used to give orders of the following sort to the youngster:

[1] H. C. Warren, "Magnetic Sense of Direction," *Psychol. Bull.*, 5: 376–377, 1908.

"Get me the brush on the north side of the dresser," "Go and sit in the chair on the east side of the porch." She did not do this to train his sense of direction but merely because it was more convenient and less confusing for her. Out of this training the boy has apparently developed the unusual ability to move about a complicated path for relatively long periods of time and retain his orientation without paying attention to the process.

From a theoretical angle the fact that this boy has learned to orient himself for long periods of time over a devious path while occupying his mind with many other things furnishes a clue to help us to understand how certain birds and animals can wander for long distances and find their way home over unfamiliar territory. If this boy can orient himself to the compass directions without voluntary attention to the task for long periods of time, then it is not difficult to conceive why certain animals, to whom such an ability would have an important survival value in hunting or being hunted, can likewise maintain this sense of continuous automatic orientation, if not to points of the compass, at least to their homes.

It is obvious that other factors need to be discovered to explain the case of an animal being blindfolded, confused and carried for a considerable distance and then finding his way home, but then many animals can not carry out this stunt. Perhaps in the few cases reported where animals have been successful in this performance, certain cues that might have enabled them to retain this continuous automatic orientation were not eliminated.

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MENDELIAN DIFFERENCES

MAY I be permitted to correct an error of attribution before it becomes more widely spread in the biological literature. Dr. E. S. Russell, in his recent very interesting book, "The Interpretation of Development and Heredity" (p. 64), quotes Johannsen[1] as responsible for the conception that Mendelian inheritance deals with *differences* rather than similarities. It is necessary to point out that this conception originated in a paper of mine[2] in 1915, where the matter is fully developed. It was also referred to again in my book "The Mutation Factor in Evolution" (1915, p. 313).

It is worth pointing out that in the same paper (p. 141) Johannsen uses the conception of a particular constitution as characteristic of every cell in each genotype. This conception is clearly stated in "The Mutation Factor" (p. 297) and, as is well known, was based originally upon the Oenothera mutations which have an extra chromosome in every nucleus. It was further considered in various aspects in "Mutations and Evolution."[3]

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE REMOVAL OF TRACES OF OXYGEN FROM NITROGEN

THREE general methods have been used to remove traces of oxygen from nitrogen: (1) To pass nitrogen through a solution which will remove the oxygen; some of the solutions used have been alkaline pyrogallol, ammonium cuprous chloride and alkaline hydrosulfite, with or without a catalyst as anthraquinone sulfonate suggested by Fieser.[1] (2) To remove oxygen with a solution such as ammonium cuprous chloride, which was placed in a large cylinder containing the gas under pressure; nitrogen, free from oxygen, but containing traces of ammonia, is delivered from the cylinder.[2] (3) To pass the nitrogen over a hot metal which will remove the oxygen and form the oxide of the metal; for this, copper has been shown to be much the most efficient, and has been used by the majority of investigators.

Variations in the potentials of solutions of cysteine which were observed in my laboratory when this type of purification was used indicated that under some conditions all traces of oxygen were not removed by the copper and suggested a reinvestigation of the problem concerned with the removal of oxygen from nitrogen.

Previous work had shown that a flow of between 200 and 500 cc of nitrogen a minute was desirable. For the removal of the traces of oxygen from this volume of nitrogen many different forms of tubes and furnaces were prepared and investigated. These need not be described in detail; the results eventually have led to a tube which has been thoroughly tested and has been proved to be satisfactory. It possesses several advantages when compared with the old type of copper furnace.

[1] L. F. Fieser, *J. Am. Chem. Soc.*, 46, 2638 (1924).
[2] H. Wartenberg, *Zeitschr. f. Elektrochemie*, p. 295 (1930).

[1] "Some Remarks about Units in Heredity," *Hereditas*, 4: 133–141, 1923.
[2] "Heredity and Mutation as Cell Phenomena," *Amer. J. Bot.*, 2: 519–528.
[3] New Phytologist Reprint No. 12, pp. 118, 1921, now published by the Cambridge Press.