University of Pennsylvania, and managing editor of the *Journal of Morphology,* who, as previously announced, is spending next year in Japan, requests that during his absence manuscripts for the *Journal,* until further notice, be sent directly to the Wistar Institute, Philadelphia.

THE South Carolina Legislature, in an act approved on May 13 and effective on that date, provided that "the property and duties of the State Food Research Laboratory at Charleston shall be associated with the State Medical College." The trustees of the Medical College have announced that, due to heavily reduced appropriations, it will be impossible to continue the laboratory, which has been engaged for some years on investigations in foods and nutrition. Present members of the laboratory staff are Drs. Roe E. Remington and Harold Levine, and Messrs. Harry von Kolnitz and F. Bartow Culp.

THE 150-foot ship that will carry Lincoln Ellsworth to the Antarctic is being prepared for its departure from Norway about the first of August for New Zealand. The ship is to leave New Zealand for the Bay of Wales about November 1, and will arrive at its base about December 15. The expedition is planning a 3,000 mile round trip non-stop flight over the Antarctic Continent.

THE California Institute of Technology has recently named a room in honor of Dr. Leon L. Watters, of New York. The room is in the Norman Bridge Laboratory of Physics and bears the following inscription: "The Watters Generator: The equipment in this room is the gift of Dr. Leon L. Watters, of New York, to the atomic structure research of the California Institute of Technology. It is designed to facilitate the generation of a steady potential of 300 KV, an energy available for x-rays ten times greater than any other equipment up to the present date." The apparatus will be employed to further the work begun by Dr. DuMond regarding which both Professor Einstein and Professor Millikan predict results of great importance.

THE Santa Barbara Museum of Natural History is building a children's loggia in memory of the former director, Ralph Hoffman. It is an addition to the east and south sides of the seismographic building, open in summer and glass-enclosed in winter, equipped with shelves and lockers and with water for modelling work. The design is by Carleton Winslow.

THE *Journal* of the American Medical Association states that negotiations for the organization of a school for public health nurses in Prague to be opened in 1934 have been completed. Construction is to start immediately. The preliminary education required for admission is to be graduation from a secondary school. Training in bedside nursing will be included in the two years course as well as a knowledge of social legislation applicable to field work. Half the cost of the construction of the school was promised to the Czechoslovakian government by the Rockefeller Foundation. The school will be erected on the grounds of the state institute of public hygiene in Prague. Bedside nursing will be practised in the near-by state hospital. Another feature of the school is that it will be for pupils both of the Czech and of the German language. The practical training in the field will be done for the Czech candidates in one of the demonstration districts of Prague, the one for German candidates in a demonstration district in northern Bohemia. The school will accommodate 100 pupils in its dormitory. It is hoped that it will create a type of field worker having the advantages of a trained nurse and at the same time knowledge necessary to understand social problems.

THE Institute of Medicine of Chicago offers a prize of $500 for the most meritorious investigation in medicine or in the specialties of medicine. The investigation may be also in the fundamental sciences, provided the work has a definite bearing on some medical problem. Competition is open to graduates of Chicago medical schools who have received the degree of M.D. during the year 1931 or thereafter. Manuscripts must be submitted to the secretary of the Institute of Medicine of Chicago, 122 South Michigan Boulevard, Chicago, not later than December 31, 1933. In the case of a paper submitted by more than one author, it is stipulated that all the authors must qualify, and that the prize paper be published under the same authorship as that under which it was submitted. The winner of the prize will be expected to present the results of his investigation before the institute at some meeting in 1934, the time to be designated later. If no paper presented is deemed worthy of the prize, the award may be withheld at the discretion of the Board of Governors.

DISCUSSION

THE PROBLEM OF TWISTED TREES

SURVEYING the various contributions to this subject, which have recently appeared in SCIENCE, the *Journal of Heredity, Journal of the New York Botanical Garden* and *Nature,* we find fair accord on the following essential points: (1) The wide distribution of

the regular tree twisting or spiral grain formation; (2) the aptitude of particular plant species to this structural form, and (3) the prevalence of tree twisting in certain localities. No agreement, however, is found as to the causes underlying this phenomenon.

Now, if we view the problem before us, in conjunction with such biological occurrences, as the curling and twisting of wool fibers, silk worm and spider's web, as well as the spiral growth of the bacterial colony filaments—we realize not only its general character but also that its solution is to be sought in the fundamentals underlying the evolution of organized matter.

Again, considering the fact that (1) the tracing of an organism's form and functions to some more primitive type of organic life is basic to our conception of evolution, (2) many fundamentals of organic life are but a reproduction of some characteristic property of the inorganic constituents (mineral medusa, mushroom and arboreal forms[1]) and (3) spiral formations are general throughout the inorganic world,[2] we may take it that the problem before us ultimately finds its foundation in the general principles of periodicity.[2]

Reviewing these principles, we find (I) periodic structures are the material record of an undulatory movement in a mobile magma. This movement characterizes generally the relationship of matter and energy and is expressible in terms of wave-mechanics. (II) as a record of change or transition periodic precipitations are determined by the relation existing between the frequency amplitude of undulation and the boundaries of the system and (III) periodic precipitations are in general not confined to physical or chemical phenomena only and are not restricted to any specific state or phase of matter or to any definite number of components.

In considering the problem of periodic precipitation, we must bear in mind, however, the fact that whilst the fundamental principles of periodicity and its material records are not limited to any state or phase, the actual type and complexity of each periodic precipitation is determined by all the properties of the particular phase of matter involved in the phenomenon. This is specially the case with the colloidal state capable of functioning as either a system-boundary, medium or component or even all these rolled together, thus evolving the mineralogical and biological periodic structures in all their ramifications.

Turning our attention to organized matter we find that minerals constitute an intrinsic component in every organic cell extending from the iron and sulfur bacteria up to the highest floral and faunal complexities.[3]

The alkaline earth group, together with some silicates, represents the material which imparts protection, rigidity and form to living matter. This function is the direct outcome of the physical and chemical properties of these substances, and therefore we may expect to find in the mineral world some primitive skeleton outline of the organic structural forms. Actually the salts of calcium, barium and strontium as well as silicates produce arboreal growth, such as creeper, bush and tree like forms.[1]

This stabilizing tendency—both in their inorganic condition and in organized matter—is undoubtedly due to the transitory colloidal state of these substances and the particular character of osmosis resulting from it. A more detailed study has shown that this characteristic is even more specific and the growth is typical to each individual radical or group.

So we find the calcium salts yield tree-like formations with a corrugated surface, barium salts give straight growth with a spiral surface, strontium salts form beautiful spirals, of a smooth tape-like growth, whilst silicates produce bamboo-like formations.

Again, our experience with the introduction of such groupings as sulfates, carbonates, phosphates and oxalates shows that the increase in constitutional complexity of the radical combinations, especially organometallic associations, is followed by a remarkable impetus in arboreal growth and general functional augmentation. Also, synthetic arboreal growth in the ferrocyanide, arsenate and arsenite groups finds probably a basic expression in the presence of hydrogen cyanide and arsenic in the organism, the assimilation of arsenates and arsenites by plants and the great therapeutic influence of arsenic on animals.

The gradual substitution of these substances by one another in the organism without impairing general metabolism seems to be well established. The silicious matter of the lower organism gave way to calcium carbonate, which in its turn was substituted by calcium phosphate in the higher forms. Our study of bacterial culture media, general nutrition and such plants as loco-weed, tobacco leaves, etc., shows that this substitution is applicable to barium and possibly strontium.

In the light of these facts it would seem that tree twisting is primarily due to local soil peculiarities which eventually modified the structural constituents of the plants. In the course of evolution the contact and inductive influences transformed the mineral efflorescence and arboreal growth into new structures more complex both in form and substance.

[1] Hatschek, *Proc. Roy. Soc.*, 95A: 303, 1919; Copisarow, *Jour. Chem. Soc.*, 233: 1927; *Koll. Zeits.*, 47: 60, 1929.

[2] Copisarow, *Koll. Zeits.*, 54: 257, 1931; *Jour. Phys. Chem.*, 36: 752, 1932.

[3] Copisarow, *Chemical News*, 134: 305, 323, 338, 1927.

The coming into being of organo-metallic and organic associations brought with it differences not only in composition but also in constitution resulting ultimately in the separation of optically active isomers by a process of gradual elimination.[4] The arboreal growth, retaining certain basic features of form inherent in their structural mineral radicles or groups, lost its arbitrary direction and became definitely orientated in accordance with the predominating stereo-isomeric form of its constituents.

The alteration in the direction of twist with age, recorded by several observers, is not really surprising. The great enzymatic transformation during embryonic development, ripening of fruit, as well as the intimate connection existing between enzymes and the cell nucleus—naturally involve a radical change in all plant constituents, which may of course be followed by a corresponding reversal of the helix.

Thus we find that the cause of the general twisting of trees is two-fold—internal and external. The internal factor is found in the specific character of the plant constituents (fusion products of heredity and environment) which determine the type of capillary spiral movement of its fluid nutrients and fibrillar depositions operating on the general principles of periodicity. In the case of young non-rigid plants these internal influences are enhanced or retarded (as the case may be) by light tropism and prevailing air currents. The systematic effect of these contributing external causes is however reduced to a minimum in old rigid formations.

Here, temperature, pressure, winds, sunlight as well as various parasitic and toxic influences may affect stature and produce structural abnormalities but do not participate in the evolution of the regular twisting in trees.

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CHLORPICRIN INJURIOUS TO GREENHOUSE PLANTS

IN view of the promising indications for chlorpicrin as a soil fumigant for nematode control, reported elsewhere,[1] recent evidence of the capacity of small concentrations of this gas in the air to injure greenhouse plants may be of special interest to investigators.

In an experimental fumigation of a plant bed just outside one of the Plant Pathology greenhouses at the University of California, Berkeley, California, some of the gas escaping from the soil found its way into the house and caused severe injury to tobacco, strawberry, coleus and other plants. The actual concentration of the gas as it became diffused into the greenhouse atmosphere was very low, probably not greater than 20 parts per million. It was detectable by a smarting of the eyes but not by odor. Details of the arrangement of the fumigated plot with relation to the greenhouse, together with illustrations and descriptions of the signs of injury produced upon the plants, will be presented in another paper, probably in *Phytopathology*. This preliminary statement is made as a warning to other investigators who may be contemplating making applications of chlorpicrin to greenhouse soils to control nematodes. If applications are made in benches or beds inside the house with growing plants elsewhere in the house, such plants may become severely injured from the escaping gas, even though they may be some distance away from the site of fumigation.

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THE ANNIVERSARY OF THE NORMAL CURVE

THE two hundredth anniversary of the discovery of the normal probability curve falls this year. It is interesting to note that the discovery of the curve was made by a man whose name is seldom, if ever, attached to it. It is also significant that the discoverer thought that his contribution was to pure or abstract mathematics and that the most practical use that could ever be made of his discovery was in connection with games of chance.

The man was DeMoivre. He published his findings on November 12, 1733. Since that time such wide use has been made of the curve that the above date becomes a landmark of considerable importance, especially in the social sciences.

In a recent book on the history of statistics[1] the following treatment of the event is found:

> The intensive study which DeMoivre gave to this work, together with his applications of the binomial theorem, led him a few years later—probably about 1721—to discover a formula for the ratio between the middle term and the sum of all the terms of $(1-1)^n$, and thus become the discoverer of the normal curve. Many of the recent treatises on probability and sampling approach the matter by a method quite similar to DeMoivre's use of the binomial expansion.
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> This formula, first published November 12, 1733, is the *fons et origo* of the normal curve. In 1730 DeMoivre had brought out his *Miscellanea Analytica* and

[4] Mills, Brit. Assoc. Adv. Science, York meeting, 1932.

[1] M. O. Johnson and G. H. Godfrey, "Chloropicrin for Nematode Control." *Indust. and Eng. Chem.*, 24: 311–313. 1932. Other papers on this subject have been submitted for publication.

[1] Helen M. Walker, "Studies in the History of Statistical Method," pp. 13–14. Williams and Wilkins: Baltimore, 1929.