bert on the question. In recent years, Eakin[6] has concluded that it is operative for the lower 600 miles of the Yukon and that it influences the pattern of the Missouri River. The deflective force acting on any moving body varies with its mass, its velocity, and the sine of its geographic latitude. The factor of latitude is of such importance that the law has seldom been considered in explaining the courses of streams other than those in comparatively high latitudes. The factors mass and velocity are such that the possibility of an asymmetric effect appears to be reduced to insignificance in the case of smaller streams. Geologists are by no means united in an opinion that even under favorable conditions valleys, thalwegs, stream-threads, or stream patterns demonstrate unquestionably a morphologic effect of earth's rotation. Sir Archibald Geikie[7] states, "When, however, we consider the comparatively small volume, slow motion and continually meandering course of rivers, it may reasonably be doubted whether this *vera causa* can have had much effect generally in modifying the form of river-channels."

With but little effort an array of examples may be marshaled in support of Baer's Law, for example, those considered by Eakin, taken from the course of the Missouri River; or, equally convincing facts may be cited against it. The most rigorous test of the whole hypothesis, in all probability, has been that applied by Exner,[8] who finds that the swift-flowing, relatively large and well-established Danube at Vienna has about one one-thousandth more corrasive effect upon the right half of its bed than upon the left. In the light of Exner's rigorous computation of the deflective force acting on the Danube it seems utterly absurd to invoke the rotation of the earth as an explanation of conspicuous slope asymmetry in valleys of small streams and rills in southern Ohio and in New Jersey, apart from the fact that the phenomena cited in my paper are not limited to right banks.

In a series of observations on the geology and geomorphology of Louisiana now being undertaken by members of the school of geology at this university the thesis advanced in Baer's Law will be closely scrutinized. Though the latitude is somewhat less than that of southern Ohio and New Jersey, adequate compensation should exist in the slight degree of induration of the sediments being cut by streams flowing across the Coastal Plain.

RICHARD JOEL RUSSELL
LOUISIANA STATE UNIVERSITY

[6] H. M. Eakin, "The Influence of the Earth's Rotation upon the Lateral Erosion of Streams," *Jour. Geol.*, 18: 435–447, 1910.

[7] *Text-Book of Geology, London* (Macmillan and Company, 1: 23, 1903.

[8] Felix M. Exner, "Zur Wirkung der Erddrehung auf Flussläufe," *Geog. Annaler*, 9: 173–180, 1927.

LIGHT A FACTOR IN RANCIDITY[1]

RESULTS of experiments conducted in the Food Research Division of the Bureau of Chemistry and Soils show that certain wave-lengths of light play an important rôle in producing rancidity of oil-bearing foods.

Rice bran and rice polish were used in this investigation. When these products were kept under color filters such as blue, purple, blue-green, yellow and various shades of red, they showed characteristics of rancidity when examined organoleptically and by the modified Schiff's test. When kept under sextant green and sextant red filters, however, they showed no evidence of deterioration either by odor or in tests with the fuchsine sulphurous acid reagent. It is evident that the green filter, which approximates chlorophyll green, absorbs all photochemically active wave-lengths conducive to rancidity, allowing only chemically inert wave-lengths to pass through. The sextant red filter, being virtually black, accomplished the same result by absorbing practically all light. Screening out certain wave-lengths of light from oil-bearing foods and feeds, therefore, prevents or delays oxidation of the oil.

Antioxidants, such as pyrogallol, hydroquinone and substituted hydroxylamines, when added to oil-bearing foods may prevent or delay rancidity, but their use is considered objectionable on account of their possible physiological effects.

The keeping qualities of foods, such as salad oils, mayonnaise, butter, lard and potato chips, may be greatly enhanced by the use of properly colored wrappers, bottles, etc., capable of screening out active light wave-lengths.

A U. S. public service patent and foreign patents covering this discovery have been applied for. The application of the principle embodied in these patents should prove of great economic value to producers of package foods.

MAYNE R. COE
BUREAU OF CHEMISTRY AND SOILS,
U. S. DEPARTMENT OF AGRICULTURE

TWISTED TREE TRUNKS ON THE GASPÉ PENINSULA

IN connection with recent discussions in SCIENCE relative to the twisting of tree trunks during growth I should like to call attention to a forested area in Eastern Canada which should prove interesting to any one working on the growth of such trees. While encircling the Gaspé peninsula in the Province of Quebec over the new Perron Boulevard, we observed, among the logs which had been brought down from the mountain forests for pulp wood, a great many which were noticeably twisted, and where the more open agricultural land is divided by rail fences,

[1] Food Research Division Contribution No. 137.

twisted rails were very common; in fences four rails high, often one out of four and sometimes three out of four would be thus misshappen. As both pulp logs and rails were stripped of bark this twisting is very evident, especially with the latter when they are old and weathered.

The Gaspé is easy of access by auto from points in Maine and Quebec and with a guide familiar with the mountain forests this area would not be a difficult place to conduct investigations. A knowledge of French would be a desideratum, for, although the peninsula has been settled for some 300 years, practically all the population still speaks French only.

BEIRNE B. BRUES

SCIENTIFIC BOOKS

The Theory of Groups and Quantum Mechanics. By HERMANN WEYL. Translated from the second (revised) German edition by H. P. Robertson. New York, E. P. Dutton and Company. 422 pp. $6.00.

THE major importance of this authoritative work on group theory and quantum mechanics has become well known to theoretical physicists since the publication of the first German edition almost four years ago. Besides providing the most modern and stimulating account of the theory of groups as a branch of mathematical discipline, Weyl's latest book gives a masterly account of the applications to quantum mechanics. The first edition suffered from an extreme condensation which made it difficult to read. The second edition includes much new material corresponding to the advances particularly in quantum electrodynamics and in the theory of chemical valence. Moreover, the new edition is characterized by considerable improvement in clarity of presentation. This, together with the fact that the work is now available to American readers in an excellent translation, should give a great impetus to the assimilation of these ideas by American physicists.

Since the subject-matter of the book is quite abstruse, the reviewer feels that a technical criticism of its contents is of less value in a journal of general interests such as SCIENCE than a short essay on the general nature of group theory and its rôle in theoretical physics.

What, then, is group theory? A group consists of any set of elements in particular mathematical operations, which possesses a few simple properties. Each element of the group is an operation performed on some object. The single operation, which is equivalent in its effects to the successive performance of two operations of the group, is also counted as an element of the group. The inverse operation or operation that "undoes" the effect of any element of the group is further counted in the group. Two elements that "undo" each other in this way are called reciprocal elements. The identical operator, or the operation which leaves the object unaltered, also must occur in the group. The mode of combination of the elements must also obey the associative law, a simple general requirement which need not be stated explicitly.

It seems astonishing that the deductive method applied to such general postulates could produce a large body of theorems. But this is the fact, as mathematicians know. Of course, although they delight to express their results in the most abstract form possible, they know too that the group concept arose in a much more concrete way than the preceding paragraph would indicate. Perhaps the subject can be traced to Lagrange's (1770) recognition of the relation of the operations of permuting a series of objects to the theory of algebraic equations. But the real development of the subject with the same application in mind began a century ago (1831) in the researches of Galois. He introduced the term "group" in mathematics in the present technical sense of the word.

The details of the theory and the kind of applications depend much on whether the group contains a finite or an infinite number of elements and if infinite, whether the elements constitute a continuous or a discrete aggregate. In elementary geometry finite groups are of interest in studying regular solids: here each element of the group is the operation of rotating the solid through some particular angle about a particular axis so that the solid after rotation is indistinguishable from its aspect before the rotation. Thus a cube may be rotated through 120 degrees about a body diagonal without altering its geometrical relation to other objects. Closely related to this application to regular solids is the use of the theory of finite groups of rotations to describe and classify the various types of crystal symmetry. Considerations of this sort made possible a theoretical crystallography (Schoenflies, 1891) which has come very much to the foreground since Laue's discovery (1912) of the diffraction of x-rays, which provided a laboratory means for finding the arrangement of atoms in crystals.

The theory of infinite groups, especially of continuous groups, that is, groups each element of which is associated with a value or set of values of one or more continuous variables, finds application in the more advanced parts of geometry. The essence of a