occur in the southern and western parts of North America," and for the genus, as a whole, it is said that there are in the world "about 50 species, natives of the north temperate zone, Mexico and the Andes of New Granada." In the second edition 73 species are figured and described from the same range, while the following statement is made for the genus as a whole. "About 300 species, natives of the north temperate zone, the tablelands of Mexico and the Andes; the center of distribution is the eastern United States." The genus has been of great taxonomic interest for ten years, about 1,000 species having been described from the United States during that period. Data are fast accumulating tending to show that many of these newly described species are hybrids.

In the Introduction (pp. ix, x) one finds the following condensed version of the "American Code," which takes the place of the longer statement in the first edition:

1. The nomenclatorial type of a species or subspecies is the specimen to which the describer originally applied the name in publication.
   (*a*) When more than one specimen was originally cited, the type or group of specimens in which the type is included may be indicated by the derivation of the name from that of the collector, locality or host.
   (*b*) Among specimens equally eligible, the type is that first figured with the original description, or in default of a figure the first mentioned.
   (*c*) In default of an original specimen, that represented by the identifiable figure or (in default of a figure) description first cited or subsequently published, serves as the type.
2. The nomenclatorial type of a genus or subgenus is the species originally named or designated by the author of the same. If no species was designated, the type is the first binomial species in order eligible under the following provisions:
   (*a*) The type is to be selected from a subgenus, section or other list of species originally designated as typical. The publication of a new generic name as an avowed substitute for an earlier invalid one does not change the type of a genus.
   (*b*) A figured species is to be selected rather than an unfigured species in the same work. In the absence of a figure, preference is to be given to the first species accompanied by the citation of a specimen in a regularly published series of exsiccatae. In the case of genera adopted from prebinomial authors (with or without change of name), a species figured by the author from whom the genus is adopted should be selected.
   (*c*) The application to a genus of a former specific name of one of the included species, designates the type.
   (*d*) Where economic or indigenous species are included in the same genus with foreign species, the type is to be selected from (1) the economic species or (2) those indigenous from the standpoint of the original author of the genus.
   (*e*) The types of genera adopted through citations of nonbinomial literature (with or without change of name), are to be selected from those of the original species which receive names in the first binomial publication. The genera of Linnæus's "Species Plantarum" (1753) are to be typified through the citations given in his "Genera Plantarum" (1754).

Enough has been said to show that the new edition differs so much from the earlier one that it must find a place upon the shelves of every botanical library.

It only remains to be said that while the new edition was passing through the press Judge Brown closed his labors, but not before he had seen the pages of the new book. To the surviving author we must offer our congratulations upon the publication of the present edition.

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The Mathematical Theory of Heat Conduction. By L. R. INGERSOLL and O. J. ZOBEL. Ginn & Co., Boston. 171 pages.

The accurate solution of problems in heat transmission has been neglected in the past by engineers. They have been content to arrive at approximate results by empirical methods or by guessing. With the increased use of electricity for the generation of heat has come the need for greater accuracy in calculating the rate of heat flow through insulation, the temperature distribution in bodies after any time interval, etc. In 1811 Fourier developed the mathematical theory of the conduction of heat, but until lately the practical applications have been few. The "Mathematical Theory of Heat Conduction," by L. R. Ingersoll and O. J. Zobel, although primarily a text-book, is a step towards making Fourier's methods available to the engineer.

After a historical sketch in the first chapter, the authors derive the Fourier conduction equation from the fundamental laws of the flow of heat. This equation is solved first, for bodies in which the temperature distribution has become steady. These bodies are the thin plate, the long thin rod, the infinitely long thin rectangular plate, etc. The general cases in which the temperature is not steady are then attacked. Equations are developed, giving the temperature as a function of the variables time and distance, the temperature distribution at zero time being known. These general solutions require Fourier's series and integrals, which are developed, and extended to the limits $+\infty$ and $-\infty$. Solutions are given for such specific shapes as the infinite solid, the semi-infinite solid, the slab, the thin rod, the sphere, etc. Also solutions are given for the cases where there is either an instantaneous or a permanent source of heat in the interior of the body. No attempt is made to prove that any of the solutions are unique, as this rightfully belongs to larger treatises.

Throughout the work the authors give many numerical applications, such as calculating the flow of heat through furnace walls; the rate of cooling of a setting concrete wall in cold weather; the heating effect of thermit welding; the rate of cooling of steel in tempering; the rate of cooling of the earth, taking into account the effect of radioactivity; the rate at which heat penetrates a fire-proof wall, etc.

In deriving the fundamental equations the authors assume, in common with previous writers, that thermal resistivity does not vary with temperature. The error due to this assumption is usually unimportant for metals, but the so-called insulating materials often show large temperature coefficients. It is necessary to consider this in many cases if we are to secure accurate results. In dealing with problems involving heat losses from a surface exposed to the air, the authors follow the custom of assuming the rate of energy loss to be proportional to the temperature of the surface. It is well know that this is not true, and there is sufficient data available in the literature to allow a much closer approximation than can be secured with the above assumptions.

One of the most important applications of the theory of heat conduction is to problems in which there are permanent sources of heat, as in dealing with electric furnaces. The authors solve a few problems of this kind, but they do not give them nearly enough attention.

Considerably more values of thermal conductivity constants have been published than are given in the appendix. The statement that "in the constants for poorer conductors the disagreement between different observers is frequently 50 per cent. or more" is correct. But there need be no such disagreement if the conditions of the measurements are given.

The book is quite the most satisfactory yet published, as a text for the study of heat conduction, and it should be widely used in engineering schools. As a reference book for the practising engineer it leaves much to be desired, although the material included in it is made more easily available than heretofore. It is a long step towards the development of an engineering knowledge of the transmission of heat.

C. P. RANDOLPH

SPECIAL ARTICLES

THE NEGATIVE PHOTOTROPISM OF DIAPTOMUS THROUGH THE AGENCY OF CAFFEIN, STRYCHNIN AND ATROPIN

SINCE the discovery that fresh-water crustacea which are normally indifferent to light could be made positively phototropic by means