Synoptic Meteorology

Atmospheric Circulation Systems. Their Structural and Physical Interpretation. E. PALMÉN and C. W. NEWTON. Academic Press, New York, 1969. xviii + 606 pp., illus. $26. International Geophysics Series, vol. 13.

Synoptic meteorology—the analysis of the atmosphere into recognizable systems with typical structures and behaviors—flourished during and between the two World Wars, and formed the basis for most weather forecasts. With the advent of digital computers, it became fashionable to regard atmospheric states as mere arrangements of wind, pressure, temperature, and moisture. To those who think that this practice, though it has revolutionized forecasting, has contributed little to physical understanding, this work by two internationally known synoptic meteorologists will be most welcome.

The circulation systems described in detail include thunderstorms, squall lines, fronts, waves in the easterlies and westerlies, tropical and extratropical cyclones, anticyclones, intertropical convergence zones, jet streams, and the global easterlies and westerlies. The authors aim in addition to show how these systems fit into the total picture, and particularly how they contribute to the global balance of angular momentum and energy; this emphasis is perhaps the work's distinguishing feature.

The book is not for the beginner; to appreciate even the opening pages one must understand such terms as "geostrophic balance" and know that "200 mb" denotes an elevation of about 12 kilometers. Meteorological knowledge equivalent to a one-semester elementary course will be a sufficient background. About one page in four contains mathematical formulas, intelligible to anyone familiar with partial derivatives. Meanwhile there is plenty for the nonmathematical reader.

In chapter 4 the authors see fit to classify air masses into only three types —a simplification that might surprise but perhaps please students of yesterday. Chapter 8, devoted to jet streams, includes the low-level jet of the central United States.

In keeping with their special emphasis, the authors devote little space to the structure of tornadoes, and waterspouts and dust devils receive no mention. Land and sea breezes fare no better. There is no discussion of weather forecasting, let alone weather modification. The potential reader may therefore wonder why the book requires 600 pages. This is partly because, despite warnings that they cannot adequately do so, the authors frequently present several viewpoints on controversial matters. The discerning reader will readily acquire a feeling for what is and is not yet understood.

The book is too specialized to be a text in elementary synoptic meteorology. For an advanced course treating certain aspects in depth, it will serve admirably. It will also answer the needs of the professional or amateur who wishes to update his knowledge of such phenomena as jet streams and tropical cyclones.

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Molten Metal Compounds

Liquid Semiconductors. VASILII M. GLAZOV, SVETLANA N. CHIZHEVSKAYA, and NATAL'YA N. GLAGOLEVA. Translated from the Russian edition (Moscow, 1967) by Albin Tybulewicz. Plenum, New York, 1969. xii + 364 pp., illus. $22.50. Monographs in Semiconductor Physics, vol. 2.

In 1960, Ioffe and Regel published a very extensive review of the properties of a class of materials designated as "liquid semiconductors" (*Progress in Semiconductors*, vol. 4, A. F. Gibson, Ed., Wiley). These include the molten oxides, sulfides, tellurides, and selenides of various metals. The main criteria for their designation as semiconducting, according to Ioffe, are (i) an electrical resistivity of 10^2 to 10^5 microohm centimeter, (ii) a negative temperature coefficient of resistance, and (iii) an anomalous composition dependence in resistivity, with resistance maxima at certain compositions suggesting nonstoichiometric doping effects.

The monograph by Glazov, Chizhevskaya, and Glagoleva is an extensive review of experimental research on liquid phases (most of which are true liquid semiconductors) produced on the melting of solid semiconductors, carried out in various laboratories throughout the world mainly over the ten years since the Ioffe-Regel review. Although the work and point of view of Russian investigators (especially those of the principal author and his colleagues) are stressed, almost half of the more than 600 references cited are from the non-Soviet literature. The material may be of interest to those who are concerned with the physicochemical properties of inorganic liquid mixtures: physical chemists, metallurgists, materials scientists, semiconductor technologists, applied solid-state physicists. It is also of possible interest to theoretical physicists and chemists who are tackling the presently incomplete formulation of a general theory of the liquid state from a statistical mechanical and quantum mechanical viewpoint. These latter will find the book useful not for the discussion of current theory of amorphous semiconductors (which is noticeably absent) nor for the presentation of critical experiments to test existing theory but because of the quantity of data presented—electrical resistivity, magnetic susceptibility, density, viscosity, and thermoelectric power—on systems ranging from elemental liquids (Si, Ge, Se, Te) to various binary (and some ternary) liquids which, for the most part, solidify to form solid semiconducting compounds at lower temperatures. These include compounds and liquid phases of the systems $A^{III}B^{V}$, $A^{II}B^{VI}$, CuI, $A_2^{III}Te_3$, Mg_2B^{IV}, $A^{IV}B^{VI}$, and $A_2^{V}B_3^{VI}$. Hall-coefficient data and direct structural data as determined from x-ray and neutron diffraction are understandably absent, in view of the limited number of investigations on the systems considered. The majority of data presented are the temperature dependences of the abovementioned properties through the melting transition of the compounds. A separate chapter entitled "Physicochemical analysis of liquid systems" includes data on the composition dependence of the electrical conductivity and the viscosity of A^{III}-Sb, Mg-B^{IV}, and various binary tellurium systems and on Ge(Si)-$A^{III}B^{V}$ quasibinaries.

The authors discount available theories as being "based on models which are far removed from real conditions." They therefore attempt to deduce semiquantitatively the constitution of the liquid state in terms of the concepts of binding (covalent, metallic, ionic) and molecular structure (short-range order, molecule and polymer formation). This is accomplished by analysis of the composition and temperature dependence of the measured properties; in the case of liquid germanium (only), the analysis is supported by structural data from x-ray diffraction. The open-