1 plate; 109 figures in text. Price, 8 Marks.

During the last fifteen years the older rather tedious and somewhat intricate methods for the calculation and drawing of crystals have been greatly simplified by the contributions of Goldschmidt, Penfield, Wulff and Hutchinson especially. The purpose of the present text is to bring together these various methods in a clear and concise form in a single treatise.

The general part of the book comprises sixty-six pages and includes a discussion of the stereographic, gnomonic and linear projections and the development of general formulas for the calculation of crystals. The use of the protractors of Hutchinson and Penfield are described at length, as is also the stereographic net of Wulff. All possible cases of crystal-calculation are then taken up fully in a discussion extending over twenty pages.

The special part of the text, consisting of sixty-one pages, is devoted (*a*) to the application of the methods of crystal-calculation, examples being introduced for each system; and (*b*) to crystal-drawing. Here the methods for the drawing of crystals directly from stereographic and gnomonic projections are given first. These are followed by those involving the use of the axial cross for the projection of simple and twinned crystals.

The treatment throughout the book is concise but clear, and illustrated with 109 diagrams. There is also a bibliography of the most important texts and papers on the subject. The book is a valuable contribution and all advanced students of geometrical crystallography should have access to it.

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The Electrical Conductivity and Ionization Constants of Organic Compounds. By HEYWARD SCUDDER, B.A., B.S., M.D. New York, D. Van Nostrand Co. 1914. Pp. 568. Price $3.00.

In the words of the author, "the object of this book is to present as far as lies in my power a bibliography of all the measurements of the ionization constants and the electrical conductivity literature between the years 1889 and 1910 inclusive, together with the values of the ionization constants, and certain values of the electrical conductivity measurements. Qualitative work is also included. . . . From 1910 to the beginning of 1913, important corrections that have come to my notice have been inserted."

As to arrangement: "The book is divided into a set of tables arranged according to the names of the compounds, containing all the data that may be given with a bibliography of all references to each compound; a formula index to the compounds; a bibliography arranged according to the names of authors; a subject index to certain subjects; and a journal list giving the names of all journals examined with the number and date of the last volume examined."

The first set of tables will show the values, if known, of the specific conductivity of the pure substance; the ionization constant; the conductivity in aqueous solution; the conductivity in solvents other than water; the conductivity under various conditions as to temperature and pressure and in various mixtures; the conductivity of the salts at many different temperatures and in many different solvents.

The vast amount of labor that the author must have expended upon this compilation will be greatly appreciated by workers in this field of physical chemistry. As the variation in the expression for the dilution law lately suggested by Kraus and Bray is likely to awaken a new interest in conductivity values and ionization constants, the book should prove to be of much service.

The list of errata is wonderfully small considering the nature of the work.

E. H. ARCHIBALD

NOTES ON METEOROLOGY AND CLIMATOLOGY

"THE Rainfall of California," by Professor Alexander McAdie (Univ. Calif. Geogr. Pub., Vol. 1, No. 4, pp. 127–240, Pls. 21–28). This

recent publication is a thorough treatment of the complex rainfall conditions of California. The chief factors controlling rainfall there are centers of action ("hyperbars and infrabars"), prevailing surface drift, ocean effect, topography and ocean currents (including upwelling cold water[1]). The influence of the positions of the centers of action may be summed up in this general law: "Typical wet winters on the California coast occur when the North Pacific low overlies the continent west of a line drawn from Calgary to San Francisco. Typical dry winters are associated with a westward extension of the continental high to the coast line and a retreat of the Aleutian low to the northwest." The prevailing surface drift of the atmosphere is northwest in summer but southerly and westerly in winter. In winter, these winds from the Pacific Ocean supply ample moisture for rainfall where topography causes them to rise. The complexity of ocean currents and ocean temperatures on this coast may locally affect rainfall.

The rainfall resulting from the combination of these factors is moderate to heavy (more than 2,000 mm.) on the west slopes of the coast ranges and Sierra Nevadas, but light on the east side. On the west slopes of the Sierras from the floor of the Great Valley to an altitude of 1,500 meters, the rainfall increases on the average about 75 mm. per 100 meters of ascent. Above 1,500 meters, the rainfall seems to decrease slightly with altitude. The rate of decrease of rainfall with decreasing altitude down the east slope is variable, depending on the height and the rainfall of the mountain crest. On the line of the Central Pacific Railroad, the rainfall decreases 147 mm. per 100 meters of descent. In southern California, the zone of maximum rainfall is much higher, and the rate of increase with altitude is about 50 mm. per 100 meters up to 2,500 m. The details of California rainfall are shown in comprehensive tables.

Parts of California are subject to excessive rains. These rains are of the cloudburst type in the drier areas. In the wetter portions, the excessive rains are less intense but of greater duration. A large table of excessive precipitation is given. In the high mountains, snowfall, so important for irrigation and waterpower, is very heavy. Special attention is paid to the snowfall and melting of snow on the ground at Summit (alt. 2,138 m.). The average annual snowfall there is more than 1,000 cm. Tamarack, a station at 2,438 m. altitude, has an even heavier snowfall. In the table, a snowfall of 2,260 cm. is indicated in the winter of 1906–07. The record maximum for any month was 998 cm. in January, 1911. The rainfall of San Francisco is treated in detail at the end of the memoir.[2]

THE MONTHLY WEATHER REVIEW

THE *Monthly Weather Review* with the January, 1914, issue has reverted to the more or less popular form it had until July, 1909. The material is classified under the heads (1) Aerology, (2) General Meteorology, (3) Forecasts and General Conditions of the Atmosphere, (4) Rivers and Floods, (5) Bibliography, (6) Weather of the Month. Some of the articles in the January and February numbers are briefly considered below.

Lorin Blodget's "Climatology of the United States": An Appreciation. By Robert DeC. Ward. (Pp. 23–27.) This great work, a pioneer in its field, receives deserved praise and attention in this article. Professor Ward quotes many of the happy and vivid descriptions of the climate of the United States and its human effects which are as valuable to-day as ever. Evidently little has been added to our knowledge of the general conditions and controls of the climates of the United States in the last fifty years. The advance has been chiefly in the study of the details.

"The Meteorological Aspect of the Smoke

[1] This upwelling is most marked in summer and is caused by the strong northwest winds of the great North Pacific high: G. F. McEwen, "Peculiarities of the California Climate," *M. W. R.*, January, 1914, pp. 14–23. See also, W. G. Reed, "The Japan Current and the Climate of California," *M. W. R.*, February, 1914, pp. 100–101.

[2] *Cf.* also W. G. Reed, "Variations in Rainfall in California," *M. W. R.*, November, 1913, pp. 1785–1790.

Problem." By H. H. Kimball. (Pp. 29–35.) On account of the usual smoke-blanket over cities, sunlight is diminished in intensity, and radiation is hindered. The effect is greatest in winter and in the early morning when the air circulation is slowest. The duration of fogs is increased by the presence of smoke because of the protection against sunlight and because of the actual coating of the particles with oil. On account of smoke and fog, higher minima and lower maxima temperatures occur in cities than in the surrounding country.

"The Effect of Weather upon the Yield of Corn." By J. Warren Smith. (Pp. 78–93.) The rainfall at the time of flowering of the corn and shortly thereafter (generally, the four weeks beginning the middle of July), is a great factor in determining the success or failure of the crop. In this period a few moderately heavy rains are most favorable. The rate of growth of the corn corresponds closely to the maximum temperatures. There are maps showing corn-acreage, dates of planting and harvesting, and the periods between these dates.[3]

ANTARCTIC METEOROLOGY

SOME of the meteorological results of Scott's last expedition are reviewed by Dr. J. v. Hann in the *Meteorologische Zeitschrift,* February, 1914 (pp. 62–67). Also a short review of an article by Prof. W. Meinardus is to be found in the *Scientific American,* April 25, 1914 (p. 347). Cape Evans (77° 35′ S., 166° 32′ E.) at the foot of the Ross Barrier, Cape Adare (71° 18′ S., 170° 9′ E.) on the west side of the Ross Sea, and Framheim (78° 38′ S., 195° 30′ E.) on the ice sheet not far southeast of the Ross Sea, are stations from which observations of some length are available. Winds of low velocity are most frequent for these three stations,—particularly for Framheim. The stillness of the atmosphere at Framheim is favorable to excessive cooling of the lower air. As a result, the annual temperature there was —24.4° C. (10 mo. obs., 2 mo. interpolated). The summer temperature was —7.3° and the winter temperature —37.8°. Cape Evans near the base of the Ross Barrier is subject to west-wind blizzards in which the wind is extremely gusty. Simultaneously, Cape Adare, a short distance north, experiences light southwest winds. This anomaly is apparently the result of the convectional circulation due to a large difference in temperature between the air at the top of the Ross Barrier and that over the Ross Sea. The dense cold air, thus forced over the cliff, makes an air-fall of great velocity (this phenomenon is known as the "bora" in Europe).

Atmospheric electricity is at a maximum in summer and at a minimum in winter, the reverse of the rule in middle latitudes. Nitric acid in rain(snow)-water is about the same in amount as that found in Europe. This fact is opposed to the idea that thunderstorms are largely responsible for the nitric acid found in rain water. The carbon dioxide content of air samples was 0.0205 per cent.—a striking contrast to the usual 0.03 per cent. of other parts of the earth. The samples from which these determinations were made were collected by Mr. R. E. Godfrey, of the Charcot Expedition, 1909–1910.[4]

NOTES

DR. HERGESELL, head of the Meteorological Institute of Strassburg, has been appointed to succeed Dr. Assmann as director of the Aeronautical Observatory at Lindenberg.

ON January 6, 1914, Dr. Nils Ekholm succeeded Dr. H. E. Hamberg as director of the Swedish Statens Meteorologiska Centralanstalt.

OBSERVATIONS of Messrs. Okada, Fujiwhara and Maeda indicate that thunderstorms may produce seiches in lakes. The change of pressure, impulsive action of the wind and rainfall seem to be the principal causes.[5]

[3] Detailed studies of plant growth as related to soil and meteorological conditions are in the course of preparation for an extensive atlas of American agriculture, under the direction of Mr. O. E. Baker, of the Bureau of Plant Industry.

[4] *Scientific American,* April 11, 1914, p. 304.

[5] *Nature,* April 30, 1914, p. 222.

The meteorological service of India is beginning aerological work with balloons sondes.

An extreme minimum temperature of — 91.9° C. was recorded with a ballon sonde on November 5, 1913, over Batavia, Java. Another ballon sonde brought down a record of — 90.9° at 17 km. altitude on December 4. Above this the temperature rose to — 57.1° at 26 km.[6]

Pyrheliometric observations obtained from ballons sondes in California last summer at altitudes of 10 to 13 km. indicate a lower solar constant of radiation than is obtained from observations at the earth's surface after transmission corrections have been added. Although a maximum altitude of 33 km. was reached, no observations were secured above 13 km. because of the freezing of the mercury.[7]

The unpublished papers of the International Meteorological Congress held at Chicago in 1893 are now appearing in the *Monthly Weather Review*.

A conference of observers and students of meteorology and allied subjects will be held in Edinburgh, September 8 to 12, 1914.[8]

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Harvard University,
May 18, 1914

Special Articles

A Culture Medium for the Tissues of Amphibians

In the course of some experiments on the culture *in vitro* of tissues from various amphibians, considerable difficulty was encountered in using blood plasma as a culture medium on account of its very rapid coagulation. When working with the tissues of the frog or of tadpoles it was more convenient to use lymph taken directly from some of the subcutaneous lymph spaces. Preparations in lymph may frequently be made before coagulation occurs, but the lymph tends to become too watery for use a short time after the frog is killed, so that only a small quantity is available from any one animal. In most urodeles the scarcity of available lymph prohibits its employment, so that plasma was at first depended on almost entirely for a culture medium.

There is little outwandering or outgrowth from the tissues of either the embryos or the adults of amphibians unless the surrounding medium is of more or less solid consistency. Amphibian tissue will live for weeks in blood serum or even in Ringer's solution, but the cells do not often grow or wander away from the rest of the mass unless they come into contact with a substance that evokes a thigmotactic response. In searching for a convenient substitute for blood plasma the endeavor was therefore made to find a medium which would remain fluid while being used, but which would solidify to about the consistency of blood clot afterwards. After some experimentation it was found that a mixture of equal parts of blood serum and a two per cent. solution of Grübler's nutrient gelatine afforded a substitute that was very successful.

The preparation of the mixture is easy. Blood drawn from the heart is stirred with a fine glass rod and the coagulum removed. The blood is then centrifuged to remove the corpuscles, and the clear serum mixed with an equal quantity of a two per cent. solution of gelatine. The gelatine solution is previously boiled and precautions are taken to prevent contamination of any of the ingredients of the medium with bacteria. I have used the mixture after it had been kept for several days, and found it to be practically as good a culture medium as when perfectly fresh.

The mixture becomes fluid when warmed slightly and remains fluid for an hour or more after being cooled to ordinary room temperature. I commonly keep it in small tubes of glass, and by rubbing the tubes briskly with the fingers sufficient heat may be generated to cause the gelatine to liquify. Should the supply of culture medium solidify while one is putting up preparations, it is only necessary to warm it slightly to keep it fluid for an hour or more longer.

[6] *Nature*, March 5, 1914, pp. 5–6.

[7] C. G. Abbot, *Scientific American*, April 4, 1914, p. 278.

[8] See *Nature*, February 12, 1914, p. 667.