instruments, particularly those connected with vapor, dust, cloud and visibility problems, which are now essential. Also every observatory should have its own airplane, or better yet a fleet of planes, and be in close touch with the travelers of the air.

Exner has included in this present edition all recent discussions on mass movements of warm and cold air streams, the various theories regarding the origin of cyclones and the behavior of air masses when in juxtaposition with sharply marked boundaries. The results of such interchange can be traced in causing or facilitating precipitation.

The latest views of the Bergen school of forecasters and the function of surfaces of discontinuity—the so-called polar front and the steering line (Böenlinie und Kurstlinie)—are given at length.

In the opening chapters on mass systems and the laws of gases, there is room for improvement and there is a departure from the C.G.S. system. While the author defines the accepted or Bjerkian bar with its thousandth part the millibar, he prefers to stick to the older unit, the pressure of a millimeter of Hg. And in a footnote regarding the distinction between mass and weight, there is a reversion to the meter-kilogram-second system. It is confusing to read about normal pressure in such units. In this respect the book is disappointing.

The opening chapters deal with the usual equations for unsaturated and saturated conditions. One is apt to get the impression that the weight of water vapor is five eighths that of dry air, forgetting that this value only holds under certain conditions of pressure and temperature. We notice also that the values of the specific heat for dry air $c_p = 0.2375$, at constant pressure and the same for constant volume $c_v = 0.1690$, are not recent values, namely, 0.2387 and 0.1701. The ratio is 1.40329. The old value which Exner uses is 1.405. In fact, the latest value is 1.402.

Succeeding chapters deal with the more general equations of dynamics and hydrodynamics, and unless one is quite conversant with spherical coordinates, there is here some hard reading.

Other chapters deal with vertical temperature distribution in the free air when at rest, which actually is seldom (if ever) the case, convection, the solar constant of radiation, the troposphere and stratosphere. The fifth chapter deals with the kinematics of moving air streams, and while the two volumes of Bjerknes are referred to, the author prefers an older treatment as being more concise and in better accord with the trend of his own memoirs; and also lending itself more readily to graphic representation. The trajectories of air flow, with points of convergence and divergence over Austro-Hungary and the Adriatic are discussed with illustrations; also the occurrence and distribution of rain on mountain summits, in connection with the deformation of stream lines.

In the last half of the book different types of cyclones and anticyclones are discussed with relation to modern theories. Thus we have the Bjerknes scheme of families of cyclones, as a series of waves or rather eddies along a polar front.

The book is a mine of information for serious readers and those who have time and care to work out the problems. In many respects it may be compared with Richardson's unique volume, "Weather Prediction by Numerical Process"; and like that book will well repay study by forecasters. For the layman it is hard of comprehension; but then let it be remembered that the vagaries of weather, that is, the complex resulting from the interplay of air streams of different pressures, temperatures, velocities and vapor content, is likewise hard to comprehend. Indeed, it is almost bewildering; and the wonder is that anticipations are fulfilled and forecasts verified as frequently as they are.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

CONDITIONS OF VALIDITY OF MACALLUM'S MICROCHEMICAL TEST FOR CALCIUM[1]

ACCORDING to A. B. Macallum (*Ergeb. d. Physiol.*, 1908, 7, 611), purpurin forms a reddish purple compound in place with calcium, and so may be used to determine the localization of calcium in plant and animal cells. The fact that purpurin is an indicator for alkalies makes it desirable to determine the reliability of this test.

To ensure the purity of solutions to be employed in this investigation the water was glass distilled and analyzed reagents used throughout. One series of experiments was made with pure solutions; and a second series with Paramoecium caudatum transferred from such solutions in which they live for days.

Neutral and slightly acid solutions of purpurin are orange, and alkaline solutions are reddish purple in color. Aqueous solutions of purpurin were added to M/24 solutions of sodium, potassium and calcium chloride and saccharose. All solutions were colored orange and in the calcium chloride solution only a heavy orange precipitate appeared.

[1] Contributions from the Department of Zoology, Smith College, No. 134.

If the solutions were made faintly acid by adding either organic or mineral acids the heavy orange precipitate persisted in the calcium chloride solution, and a fine orange precipitate appeared in the solutions of sodium and of potassium chloride. There was no change in the color of the mixtures. If the solutions were made alkaline by the addition of sodium or potassium carbonates or hydroxides all the solutions became reddish purple. The fine precipitates in the sodium and potassium chlorides disappeared, the heavy precipitate in the calcium chloride remained and became a deep reddish purple. Thus it is evident that purpurin forms a distinctive reddish purple compound with calcium only in alkaline solutions.

In view of the fact that living protoplasm is approximately neutral it was of interest to determine under what conditions Paramoecia would stain with purpurin. From cultures in which they were abundant, Paramoecia were allowed to rise into glass tubes filled with glass distilled water, and transferred to additional tubes of such water. In this way they could be freed from the culture medium and kept in distilled water for several days or could be transferred to solutions of sodium, potassium, or calcium chloride or saccharose in which they will remain alive for one or more days. Acid or alkali was added to these solutions in some experiments.

The test as devised by Macallum entails the killing of the cells. In this investigation the Paramoecia were either killed in place on cover slips by the fumes of osmic acid, then washed in 70 per cent. alcohol and stained with a saturated alcoholic solution of purpurin; or were killed by transferring them to a small amount of boiling water, then to a slide on which the water was allowed to evaporate somewhat, then fixed and stained with the purpurin solution for ten minutes. All sides were then washed in alcohol, xylol and mounted in balsam.

Paramoecia transferred from an alkaline medium containing calcium and treated with purpurin are stained locally. The pellicle, the nuclear membrane and surfaces of vacuoles become a deep reddish purple. The more concentrated the calcium and the alkali in the solutions or the longer the exposure to the calcium solution the deeper is the color. Those transferred from a medium containing sodium or potassium chlorides or saccharose are diffusely stained. The color in a neutral or acid solution is orange; in an alkaline solution is reddish purple.

Macallum's test is satisfactory if the medium from which the cells are transferred or in which they are killed is alkaline in reaction.

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SPECIAL ARTICLES

THE STEWART BANK IN THE CHINA SEA

DURING a visit to the Hydrographic Office of the Navy Department at Washington last May, opportunity was given me of examining the soundings made by the sonic depth finder on the U. S. Destroyer *Stewart* in the China Sea in March, 1924. It should be here recalled that this vessel was the one on which a line of echo soundings was first carried across the Atlantic from Newport, R. I., to Gibraltar in June, 1922, and that its echo soundings were then continued through the Mediterranean and Red seas, across the Indian Ocean, and into the Pacific; profiles of depths thus determined have been published in a series of charts, numbered for the Mediterranean, H O, misc. 2496–2498, and for the Indian Ocean, H O misc. 2575–2579.

Later soundings by the *Stewart* show that, within the deep, enclosed basin of the China Sea, a bank, measuring about eight miles east–west by five across, with its summit at from 300 to 160 fathoms, rises rather rapidly from depths of 2,000 fathoms, more or less; its center is 83 miles northwest of Cape Bolinao, northwest Luzon, in 17° 16′ N, 188° 34′ E.

This discovery is of merit, for banks of so considerable a depth are seldom charted in the deeper oceans, perhaps less because of their objective rarity than because navigators, after finding "no bottom" at fifty or one hundred fathoms, are generally in the habit of sounding no deeper. The discovery of a deep bank is moreover of special significance in the coral-reef problem, because the lack of charted records of such banks in the coral seas has been taken as indicating their actual absence from the ocean. Yet, according to Darwin's theory of upgrowing reefs on subsiding foundations, some banks of such depths, representing strongly submerged barrier reefs and atolls, ought to be found there; furthermore, if deep banks can be produced in other ways than by the strong submergence of surface reefs, they ought to be doubly numerous; yet they are almost unknown in coral-reef regions. Evidently, if a bank of two hundred-fathom depth has already been found at, as one may say, the very outset of oceanic exploration by echo sounding, and in an oceanic region so frequently traversed as the China Sea, where other banks of smaller depth, like the Tizard and Macclesfield, appear to represent slightly drowned reefs, it is to be presumed that additional examples of deep banks representing strongly drowned reefs, as this one seems to do, will be discovered in the less-explored parts of the broad coral seas in the open Pacific, as echo sounding is more widely extended. On the other hand, if Darwin's theory be correct, such banks should