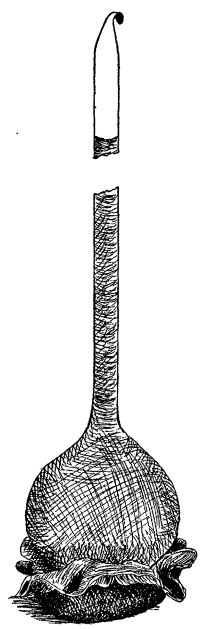
magn.; on April 12 it was 0.40 magn., and on May 6 and 7 it was imperceptible and apparently less than 0.1 magn.

EDWARD C. PICKERING.

HARVARD COLLEGE OBSERVATORY, May 8.

A SIMPLE OSMOMETER.

THE end of a thistle tube is drawn out, broken off and closed temporarily with wax. The bulb is then filled with molasses and a piece of pig's bladder,* is securely but loosely tied over the



mouth. The wax is removed from the end of the stem and the end well fused. Two thicknesses of strong linen are tightly drawn and securely tied over the membrane to take the strain. The bulb is then placed in water, when in a few minutes the column of liquid becomes higher and the air column compressed by the osmotic action through the membrane.

In two or three days the maximum pressure is obtained, then the length of the air column is taken. The air in the stem is allowed to expand to its normal condition by puncturing the membrane with a needle and the length of the air column measured; which length, divided by the length under compression, gives the pressure in atmospheres.

The greatest pressure I have yet obtained with an apparatus of this sort is the expansion of 1.5 cm. to 13.2 cm., showing a pressure of 8.8 atmospheres, or 668.8 cm. of mercury, or 129 pounds per square inch.

The highest pressure I find recorded for Pfeffer's cell is 436.8 cm. mercury.*

The air column after expanding will not be so long by six to eight per cent. as it was before compression, showing that some of the air has been absorbed by the liquid.

The accompanying figure will serve to show how the apparatus is arranged.

E. E. BOGUE.

LABORATORY OF PHYSIOLOGICAL BOTANY, HARVARD UNIVERSITY, April 16, 1901.

* These bladders may be obtained of Kny-Scheerer Co., 19th street and 4th Avenue, New York City. They are clean and dry like parchment, and cost ten cents each or one dollar per dozen.

* Goodale's 'Physiological Botany,' Vol. II., p. 229.

CURRENT NOTES ON PHYSIOGRAPHY.

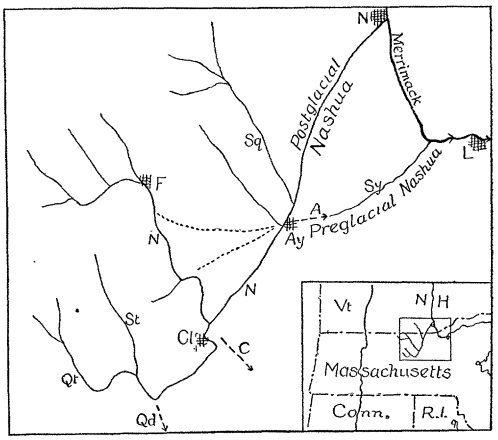
PHYSICAL GEOGRAPHY OF THE TEXAS REGION.

THE third folio of the Topographic Atlas of the United States is entitled 'Physical Geography of the Texas Region' by Hill. It may well serve as a type of many to follow. Twelve folio pages are given to text, chiefly concerned with an explanation of relief and drainage; then follow a sheet of nine climatic and other diagrams, four sheets holding 22 photographic views of typical landscapes, five sheets presenting 24 small topographic maps of typical reliefs and streams, and finally a folded map of Texas drawn under Hill's direction by Selden and Johnson on a scale of 25 miles to an inch with contours every 250 feet. The imperial area of the 'Texas region' is indicated by the statement that each of more than twenty physiographic subdivisions has an extent equal to that of an average State. Mountains, plateaus and plains, canyons, valleys and waste-floored basins (bolsones) are described in so great variety that selection for special remark is difficult. Descriptions are marked by a thorough-going adoption of explanatory methods, such as have always found ardent ad-

vocacy in Hill's writings. Terminology is largely flavored with words of Spanish origin, taken from the language that was once general and that is still familiar towards the Rio Grande. Plains are classified as constructional and destructional; the first being the result of accumulation, the second of denudation. Constructional plains are either sea-made or land-made; the latter including many examples of surfaces covered by the coarse or fine wash from higher ground. The destructional plains here found are usually 'stratum plains,' that is, surfaces of hard strata from which weaker overlying strata have been stripped; and of these three sub-classes are given, mesa plains, dip plains, and cut (or dissected) plains. Paleoplains is suggested as a name for buried destructional plains, but the word is objectionable etymologically; ancient plain may serve instead, as all the other classes of plains are indicated by adjectives. The descriptions of the Texan rivers show clearly enough that the conventional idea of a river as a constant current of water needs many modifications to fit it to regions of moderate rainfall and plentiful rock waste.

THE NASHUA VALLEY, MASS.

THE 'Geological History of the Nashua Valley during the Tertiary and Quaternary periods' is discussed by Crosby (*Technology Quarterly*, Boston, XII., 1899, 288–324, 2 maps, 2 pl.). The lower lands of eastern Massachusetts are regarded as parts of a Tertiary peneplain, eroded beneath the uplifted Cretaceous peneplain of the central and western uplands of Massachusetts; the remnants of the latter form hills on the former. Previous to the Tertiary erosion, a coastal plain of Cretaceous sediments is supposed to have overlapped the southeastern part of the older peneplain and through this cover a number of east or southeast-flowing rivers were superposed on the greatly deformed and denuded underlying rocks. Traces of this system of drainage are found in the headwaters of certain rivers whose valleys now converge in a general southeasterly direction towards notches in the hills through which their united volume is thought to have once continued in about the same course, but from which it seems to have been in several cases diverted by headwater capture by small streams that grew along a belt of weak slates. The upper Nashua river is the best example of this kind, a number of its head-



Rough Diagram of Nashua River System, Mass. Cities: Ay., Ayer; Cl., Clinton; F., Fitchburg; L., Lowell; N., Nashua. Streams: N. N., Upper Nashua; Qt., Quinepoxet; Sq., Squannacook; St., Stillwater, Sy., Stony. Tertiary Water Gaps: A., Ayer; C., Clinton; Qd., Quinsigamond.

water branches having been gathered from other systems into a single trunk. During the progress of these captures and adjustments, broad, low-grade valleys were opened, their sub confluent floors constituting the Tertiary peneplain, above mentioned. A number of narrow gorges in these valley floors, now concealed by drift and discovered by borings in connection with the extensive works of the (Boston) Metropolitan Water Board, are explained as the result of a preglacial elevation; and as such they may come to be compared with the narrow young valleys so distinctly seen in the uplifted Tertiary peneplain of Pennsylvania, but not hitherto identified in central New England. During the retreat of the ice sheet, lakes were formed in front of it in the upper Nashua valley; their outlets were across notches among the hills, at whose level a number of deltas and sandplains are now found. Drift obstructions in the broad notch traversed by the preglacial Nashua trunk seem to have diverted its flow northeastward along its present lower course into the Merrimack.

It is to be hoped that fuller details, especially in

the form of maps, may in due time be presented regarding the glacial lakes above noted. As to the restoration and development of the Tertiary drainage systems, the problem is inherently difficult on account of the unproved inland extension of the Cretaceous coastal plain, of the complicated rock structure of the region, of the uncertain relation between river volume and valley size in the advanced stage reached by the Tertiary cycle of erosion before the glacial period, and of the large volume and irregular distribution of the drift. Additional examples of streams, explainable by the same theoretical process, would perhaps lead as far towards demonstration as the case allows.

W. M. DAVIS.

CURRENT NOTES ON METEOROLOGY.

MONTHLY WEATHER REVIEW.

THE *Monthly Weather Review* becomes more and more indispensable to teachers and students of meteorology with every succeeding number. Under the able editorship of Professor Cleveland Abbe, the *Review* is rapidly enlarging its scope and its sphere of usefulness. The number for December (issued in February) contains, among its special contributions, 'The Circulatory Movements of the Atmosphere,' a translation of portions of a paper by Professor V. Bjerknes, recently published in the *Meteorologische Zeitschrift*, and 'Line Integrals in the Atmosphere,' by Professor F. H. Bigelow. In the 'Notes by the Editor,' Professor Abbe takes up a great variety of topics. In 'Micro-Photographs of Snow Crystals,' the history of the study of snow crystals is briefly reviewed. Under 'Bombarding the Hail Clouds' the question as to the possibility of dispersing hail storms by means of cannonading is answered by Professor Abbe as follows: "The Editor would state that although statistics show that during the past year 15,000 shooting stations were established in Italy, and a very large number in southern France and Austria, yet there is no evidence whatever that the shooting done by these stations has had any effect whatever upon the hailstorms or the hail." A short paper on 'Oscillations of the Lakes and the Climate in Arid Regions' mentions the decreasing depth of Great Salt Lake, the notable diminution of the quantity of water in the streams and wells of Turkestan and Bokhara, and the shrinking of Lake Ngami, in South Africa, and points out that these observations do not indicate a permanent change in the conditions of the atmosphere, these lakes having gone through many similar dry periods before now. Other papers are 'The Commercial Importance of Storm and Weather Forecasts,' 'The Evolution of the Thermometer' (a review of Dr. H. C. Bolton's recent book); 'Correlation of Weather in Distant Localities,' and 'Lightning from Cloudless Skies.' A recent investigation of the 'Relations between Summer and Winter Temperatures,' by Dr. O. L. Fassig, of Baltimore, is found to show that neither warm nor cold summers have any more relation to the succeeding winter temperatures than have the normal summers, or, in general, that there is no regular alternation or period in atmospheric temperatures.

NEW CHARTS OF MEAN MONTHLY RAINFALL.

THE first charts showing the mean monthly rainfall for the world were constructed by Dr. A. J. Herbertson, and published in Bartholomew's new 'Atlas of Meteorology' (1891). Several charts of mean annual rainfall had previously been published, the first fairly complete one being that of Loomis (*Am. Journ. Sci.*, third series, Jan., 1882; revised edition, *Ibid.*, Jan., 1883). Seasonal rainfall charts have recently been constructed by Supan. Herbertson's monthly rainfall charts have now appeared in 'The Distribution of Rainfall over the Land' (*Roy. Geogr. Soc.*, London, 1901, 8vo, pp. 70), on a considerably larger scale than that adopted for them in the 'Atlas of Meteorology.' The discussion is also much more extended than in the 'Atlas.' This monograph will naturally not attract as much attention as it would have done had not the charts already appeared, but nevertheless it may be said that Herbertson's 'Distribution of Rainfall over the Land' is one of the most important meteorological publications of recent years.

NOTES.

ARCTOWSKI, the meteorologist of the *Belgica* expedition, contributes to *Ciel et Terre*