

LETTERS TO THE EDITOR.

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New Units in Aerology.

IN NATURE of February 5, p. 629, is a reference to the new edition of the "Observer's Handbook" of the Meteorological Office, and complimentary mention of the proposed extension of c.g.s. units. On this side of the Atlantic, we have not yet seen the book, but feel that Dr. Shaw and his associates have with characteristic progressiveness done well in opening the campaign for the use of rational units. It will be hard for the present generation to depart from the old notation; but for those who are to follow, the adoption of these units means clearer conceptions of atmospheric motion, fewer mistakes, and great ease of compilation. Briefly, the units are those proposed by Köppen at Monaco in 1909, and advocated by V. Bjerknes at Vienna in 1912. Temperature is given in degrees Centigrade on the absolute scale, and pressure is recorded in *bars* and decimal parts thereof, as *decibar*, *centibar*, and *millibar*.

We began using these units at Blue Hill Observatory, January 1, 1914, and within a fortnight had our attention directed by Prof. Kennelly to the fact that unknown to meteorologists at home (and presumably abroad), the *bar* was in use and had an established meaning among chemists and others. If we continue its use without definition we only add to the confusion already existing.

So far back as 1888 the word *barad* was proposed by a committee of the British Association as a suitable term for the unit of pressure, one dyne per sq. cm. In 1903 Prof. T. W. Richards¹ independently suggested that the pressure of one dyne per sq. cm. be called a *bar*. He also suggested *megabar* for a c.g.s. atmosphere. So far as I can ascertain this is the first clear-cut definition of an absolute atmosphere. Ostwald in 1899 had the idea and advocated the use of one million of the units as a standard pressure, but gave no name to the large unit. Richards has used the *bar* consistently in his work, likewise Kennelly² and others. It has been definitely adopted by the International Congress of Physicists, independently of Richards's proposal under the name *barie* (see Guillaume's "Récents Progrès du Système Métrique," Paris, October, 1904).

It seems almost unnecessary to argue that the smaller *bar* should be the basic unit and not some multiple. And again, it is doubtful if *bar* is the most appropriate designation for the pressure of an absolute atmosphere. *Aer* is a more significant word. *Megabar* is not altogether inappropriate, and, as we have seen, is established in the literature of chemistry, and cannot readily be displaced. The *megabar* in the notation of the aerologist means the pressure of a million atmospheres, a magnitude not often dealt with; while on the other hand we sometimes need to express pressures smaller than the millibar of the aerologist. Now the *bar* of the chemist and physicist lends itself nicely to the measurement of these feeble pressures, since it is divisible down to its millibar, *i.e.* the thousandth of a dyne per sq. cm.

To contrast the two systems, I have made the fol-

¹ Pub. 7 Carnegie Inst., 1903, p. 43; also Jour. Am. Chem. Soc., vol. xxvi., 1904; T. W. Richards, W. K. Stull.

² Am. Inst. Elec. Engineers, June, 1909; Kennelly, Wright, and Van Bylevelt.

lowing table, and at the suggestion of Prof. Richards have restricted it to the terms in common use.

Chemist and physicist (To be used by all hereafter)	Aerologist (To be abandoned)	Remarks
—	1 megabar	A million atmospheres; beyond direct measurement
1 megabar	1 bar	The absolute atmosphere; equal to 750.1 mm. Hg, or 0.987 of usual sea-level atmosphere. One megadyne per sq. cm. acting through 1 cubic cm. does 1 megerg of work.
1 kilobar	1 millibar	1 kilodyne per sq. cm.
1 bar	?	1 dyne per sq. cm. acting through 1 cubic cm. does 1 erg of work.

There could be no objection to giving the term *megabar* or absolute atmosphere some convenient nickname, such as "Aer," if *megabar* seems too ponderous. Prof. Richards has also suggested that for historical reasons the pressure of ten absolute atmospheres might be named after some pioneer in meteorology as Guericke or Torricelli or Pascal; but this need not be dwelt upon at present.

Fortunately we can change from the aerologist's system to that of the chemist by writing *kilobar* for *millibar*, and by substituting "aer" for "bar." This we are doing in the handy conversion tables now in course of preparation at this observatory.

Now is the time to agree upon a logical and available system. The *megabar* atmosphere seems to me to be the more appropriate; but perhaps some of the readers of NATURE can suggest something better.

ALEXANDER MCADIE.

Weather Forecasting.

MR. MALLOCK quotes in NATURE of February 26 (p. 711) a sentence of the late Sir G. Airy concerning the amassing of millions of useless meteorological observations. Unfortunately, in scientific work a vast amount of work which is not immediately productive has to be done. Indeed, it is not possible to foresee with accuracy what the result of any particular investigation will bring forth. But I do not think that this feeling will deter scientific minds from working, for each advance beyond the frontiers which limit our knowledge makes up for the disappointment resulting from many apparently unsuccessful expeditions.

It is acknowledged that in this country, indeed in this latitude, the weather depends largely upon travelling cyclones which reach us from the Atlantic. Now our knowledge of the nature and origin of cyclones is very limited, and recent researches of the upper atmosphere have shown that a good deal of accepted theory concerning them is unsound. In spite of the millions of observations which have been, and are being, taken, we have no detailed information concerning the conditions obtaining in any one cyclone, and the changes which have occurred in it during its passage over the land or sea. In these circumstances it is not surprising that weather forecasting should be difficult and uncertain. Now whilst such a lamentable want of knowledge concerning atmospheric disturbances exists, it surely cannot be maintained that we already have too much information, and that further research is undesirable.

The main question really is as to the direction such further research should take. Dines enters a plea for further research concerning the condition of the upper atmosphere. Considering that it is this kind of work