

A *Sylow Factor Table of the First Twelve Thousand Numbers, giving the Possible Number of Sylow Sub-Groups of a Group of Given Order between the Limits of 0 and 12,000.* By H. W. Stager. Pp. xii + 120. (Washington: Carnegie Institution of Washington, 1916.) Price 4.50 dollars.

THE main object of this publication is to answer the question: Given n , the order of a group, what are the possible orders of such Sylow sub-groups as it contains? This amounts to finding all divisors of n which are of the form $p(kp+1)$, where p is prime. For each n up to 11,999 the table gives the complete resolution of n into its prime factors, and the values of k (other than 0 and 2, which do not require entering) corresponding to each prime factor. Each prime value of n is entered in the body of the table in the form p_1 ; for instance, the entry p_{627} under 4639 shows that the latter is the 627th prime in order of magnitude, taking $p_1=1$. It is obvious that, apart from its special purpose, this table will be very useful to arithmeticians; every reasonable precaution seems to have been taken to make it accurate, and fortunately the table is of such a kind that every single entry can be tested with very little trouble, and any misprint almost certainly detected, unless a number n has been entered as prime, when really composite. Cases where $p(kp+1)=n$, and not merely a divisor of n , are noted, such numbers are called Ps by the compiler—for instance, $1074=3(3.119+1)$, so 1074 is a P. On pp. xi and xii is a list of these numbers (1–12,229) in their natural order; and there are interesting tables and graphs on the distribution of P numbers and primes. Supposing that $\phi(n)$ means the number of primes not exceeding n , and $\psi(n)$ the number of P numbers not exceeding n , the tables suggest that when $n \rightarrow \infty$ the ratio $\psi(n)/\phi(n)$ converges to a definite limit not very different from e ; of course this is a mere guess that might occur to anyone, but at any rate to find a formula for $\psi(n)$ analogous to Riemann's for $\phi(n)$ would be an interesting problem. It may not be superfluous to add that the table does not profess to enumerate *actually existent* Sylow sub-groups for different values of n .

LETTERS TO THE EDITOR.

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Aeroplanes and Atmospheric Gustiness.

THE question which Prof. McAdie raises in his letter in NATURE of April 12 is how to measure the unsteadiness of the air as it affects an aeroplane. Among those connected with flying the term "bumpiness" is used to express the unsteadiness of the air as it affects an aeroplane, and, in the absence of a better word, this may be used here. The problem is, then, to measure the "bumpiness" of the air by meteorological means.

As Prof. McAdie points out, gusts may occur in any

direction, but gusts in different directions will not equally affect an aeroplane, those in a vertical direction having the greatest effect. There is evidence to show that the fluctuation in velocity of any individual portion of air is, on the average, roughly the same in any direction, so that, in view of the greater effect of vertical gusts, the fluctuation of the wind, as given by an anemometer, may give entirely erroneous indications of the "bumpiness." The best example of this is in the middle of a hot summer day, with a light wind, and sky partly covered with small cumulus clouds (themselves an indication of vertical currents). Under these conditions, the variation shown by an anemometer may be less than three metres per second, but the air will be very "bumpy" for an aeroplane.

On sunless days, with strong winds, the air is "bumpy" on account of the eddy motion set up by friction with the surface of the ground. If the conditions be the same, the fluctuation is roughly proportional to the mean velocity of the wind, but under different conditions—e.g. between night and day—the fluctuation may be very different for the same strength of wind. When it is remembered that the mean velocity of the wind does not in itself affect an aeroplane when flying (except as regards getting from place to place), it will be seen that the mean velocity of the wind should not enter into measurements of the "bumpiness" of the air. Further, the gustiness of the air near the ground is of little importance, except in getting off and landing, and also it cannot be taken as an indication of the "bumpiness" of the air at a height.

To obtain satisfactory information, it would be necessary to measure the fluctuation of velocity in three directions and at various heights. Several methods have been devised for obtaining the vertical velocity, as well as the horizontal velocity and direction, near the ground; to obtain such data at a height is very much more difficult.

The "bumpiness" of the air might be measured by an accelerometer carried on an aeroplane; but this would not be satisfactory to the meteorologist, since it would be difficult to discriminate between vertical currents and horizontal gusts. It may be pointed out that by the use of both a gravity-controlled and a spring-controlled air-speed indicator, this is at least theoretically possible.

If we suppose a satisfactory means of measuring the "bumpiness" to have been devised and standardised, it would be possible to compare the average "bumpiness," say, at one place with that at another, from which, no doubt, some useful information could be obtained. But to make real advance in this part of meteorology, it is necessary to go further and endeavour to find the real structure of the atmosphere and the causes which may give rise to this structure. It is, therefore, to be hoped that the work of meteorologists interested in this branch of the subject may be devoted more and more to these fundamental problems of cause and effect, rather than to the making and tabulation of routine observations, other than those made with the definite object of throwing light on some particular problem.

GORDON DOBSON.

Farnborough, April 16.

IN reply to Prof. Alexander McAdie's request (NATURE, April 12) for a means of recording gustiness, I venture to throw out the suggestion that this might be done by observing what in German is called "wimmern." "Hoert Ihrs wimmern hoch vom Thurn? Das ist Sturm." This variation in the sounds heard from church bells during gusty weather is due to the irregular velocities in the atmosphere. That part of