line of the initial letter, thus: P4. In that way it has the same form and meaning as a date written, Jan. 4. The several members of the premolar series may be designated as P1, P2, P3, P4. The same is true of other teeth in other series.

Now, having disposed of the dash, it becomes necessary to distinguish between the upper and lower teeth. Let us employ the printer's distinction of upper and lower case. For upper premolars we will use the capital letter as an index to the series, thus: P4, for lower premolars we will use the small letter, thus: p4. This will be found distinctive and the difficulty of typing and type-setting at once disappear. The plan has in its favor the two-fold arguments of distinctness and of economy.

E. S. RIGGS

FIELD MUSEUM, CHICAGO

TERMINAL ZIGZAGS IN SNOWSLIDE STRIATIONS

IN his interesting article on "Snowslide Erosion,"[1] Mr. Dyson invites discussion of the mechanics of the formation of zigzags in the terminal portions of the striae cut by boulders carried in snowslides. It seems probable that this erratic motion of the boulders is brought about by a similar movement of the snow by which they are transported. It has occurred to the writer that the behavior of the snow in this manner may be analogous to that of a viscous liquid upon being poured in a small stream from a moderate height.

As a rather homely example, let us consider the manner in which our breakfast syrup (if we like it thick) behaves when its fall is arrested by the horizontal surface of the pancake. The falling column of syrup does not simply impinge vertically and expand in all directions from the point of contact. Rather, it swings to and fro at the end, laying down an intricate pattern of undulant loops which merge one into another and then spread out over the surface. These loops may sometimes fall with their long axes parallel, but more commonly so that each loop crosses its predecessor at an angle, in which case the end of the falling stream soon assumes a circular motion; seeming to descend in a widening spiral which merges into the surface of the expanding pool of liquid.

The reason for this lateral oscillation in the lower part of a falling stream of thick liquid seems fairly obvious. Briefly, the end of the stream must receive a slight deflection toward one side or another at the moment of contact due to slight irregularities in the surface against which it strikes, so that the stream is bent away from the vertical. If the fluid is sufficiently cohesive internally, this deflection will tend to increase until it reaches a certain amplitude, whereupon it reverses itself. This reversal is due to the fact that the vertically descending portion of the stream surpasses in velocity that which is falling at an angle to the perpendicular and begins to crowd against it so that it is itself deflected from the vertical and in the opposite direction. This new deflection continues to grow until the critical amplitude is again reached, whereupon another reversal occurs. Since the same conditions which give rise to this terminal oscillation also obtain, though to a lessening extent, in the adjacent part of the stream a series of oscillations of diminishing amplitude appears in this region.

Let us imagine this falling stream of syrup confined between two parallel sheets of friction-free glass, sufficiently far apart to permit the stream to fall freely except that its axis must remain oriented in the same plane throughout. Since we are postulating frictionless glass we can probably tip the ensemble to an angle equal to that of the snow slope without upsetting the conditions that cause the oscillatory motion. If the stream were now suddenly to congeal, the figure presented would be not unlike the path of one of the stria-forming boulders. The path of an individual particle in the center of the falling stream of syrup would closely resemble the striae described. Perhaps we may consider the snowslide as a viscous stream confined between the planes imposed upon it by the solid bed and by the gravitational force acting upon it. To the writer it does not seem too fanciful to believe that the moving column of snow may behave in a manner similar to that of the syrup when the forward part of the column is brought to a sudden stop by meeting some obstacle head-on, which obstacle may consist of large rocks, a sharp change in the angle of the slope or simply more snow in a state of rest.

If the analogy here presented be valid, then the zigzags in the snowslide striae should show a greater amplitude near the lower end than at their inception. It should be of interest to inquire of Mr. Dyson whether or not such an increase of amplitude was noted in the final portion of the zigzags at the time of his observations in Glacier Park.

J. ROBERT WELLS

LA OROYA, PERU

[1] J. L. Dyson, SCIENCE, 87: 365–366, 1938.

A WINTER WHIRLWIND

WHILE driving toward Red Wing, Minn., on the afternoon of November 23, I noticed an old-fashioned whirlwind pass across the road. A slight snow was falling, with the sun visible at some instants. The temperature was 20 degrees above zero and the wind about 8 miles per hour from the northwest. The whirlwind appeared to be the kind I used to see down on the farm in the Ozarks on a warm summer day, except that it was picking up a lot of snow and moving along with the wind. Due to traffic conditions I could not observe any distance up into the air. The whirl was so filled with snow that it was practically impossible to see any objects through it as it passed my path. This may not be of any great interest, but I don't recall reading or hearing about whirlwinds in the winter-time, which accounts for my calling the matter to the attention of the readers of SCIENCE.

H. D. MATTHEWS

MINNEAPOLIS

"TITANS OF THE DEEP"

I WOULD like to correct a rather vital misconception in regard to the film now running in New York City and elsewhere in the country, called "Titans of the Deep." This is being credited to me and my associates, whereas neither I nor any member of my staff of the Department of Tropical Research, nor any one connected with the New York Zoological Society, had anything to do with it.

At the very beginning are shown a few authentic shots of the Bathysphere, but all the rest of the film is the work of Mr. Otis Barton, and was taken in Panama at his own expense and with no relation to the Bathysphere. I never saw any of it until it appeared on a New York screen. Together with my staff, I would like completely to dissociate myself from this motion picture and to have it known altogether as the work of Mr. Barton. In a recent letter he tells me he has been trying to accomplish this correction, but without success.

WILLIAM BEEBE

DEPARTMENT OF TROPICAL RESEARCH,
NEW YORK ZOOLOGICAL SOCIETY

SCIENTIFIC BOOKS

STATISTICAL METHODS

Statistical Methods—Applied to Experiments in Agriculture and Biology. By GEORGE W. SNEDECOR. Collegiate Press, Inc., Ames, Iowa, 1938. xiii + 388 pp. Price $3.75.

IN the preface, the author writes: "It is a pleasure to acknowledge the leadership of Professor R. A. Fisher. . . . By his residence as guest professor in mathematics at Iowa State College as well as through his writings he has exercised a profound influence on the experimental and statistical techniques of the institution." It is not surprising, then, that Snedecor's book should resemble R. A. Fisher's "Statistical Methods for Research Workers" more than it resembles the usual text-book on statistics. And the appearance of a sixth edition of the Fisher book (1936) testifies to the assistance that such a book can render to investigators, especially to those working in biological fields. Fisher's book is a reference book, almost devoid of mathematical proof, giving by detailed examination of numerous problems some of the most important principles of statistical research, with special emphasis upon significance tests. Snedecor's book proceeds along the same general lines, but the latter is a little more informal, it devotes a little more space to making plausible what it does not attempt to prove, and it inserts 417 examples, enough to make it a practical text-book as well as a reference book.

The following three problems taken from the first three chapters will illustrate the type of problem in which the author is most interested:

Example 1.10—An entomologist was trying to adjust the concentration of a spray so as to kill 50% of the flies in a container. Having got what seemed to be a satisfactory mixture, he sprayed a batch of 128 flies, killing 55%. Show that this is not a significant deviation from the 50:50 expectation. 2.30—Assuming that the coefficient of variation of yields in field plot tests with wheat is usually near 5%, would you be surprised if told that in an experiment where the yield was 25 bushels per acre, the standard deviation of plot yield was 0.5 bushel per acre? 3.17—An agronomist interested in the effect of superphosphate on corn yield tried adding the fertilizer to a treatment of manure and lime. Five pairs of plots were tested. The plots with superphosphate yielded 20, 6, 4, 3 and 2 bushels per acre more than their parallels. Was the value of superphosphate demonstrated?

The book contains a number of useful tables for statistical computations. Unfortunately, these are imbedded in the text, instead of being placed in an appendix. Disregarding Table 1.3 as one row of Table 9.1, these tables appear as follows:

Page 58. Values of t at the 50%, 5% and 1% levels. Here t = (Computed average x—Theoretic mean x)/(Computed standard error of the average).

Page 89. Values of the ratio (Range)/(Theoretic standard deviation) for various sample sizes, n.

Page 133. Correlation coefficients at the 5% and 1% levels of significance.

Page 152. Ordinates of the normal curve (4 decimals).

Page 154. Cumulative normal frequency distribution (4 decimals).

Page 163. Chi-square at levels 99%, 95%, 50%, 30%, 20%, 10%, 5%, 1%.

Page 184–187. F = (Larger variance)/(Smaller variance) at 5% and 1%. (Applicable to problems in analysis of variance.)

Page 286. The 5% and 1% points for r and R. (Simple and multiple coefficients of correlation.)

Page 329. Coefficients and polynomials for terminal values and differences for fitting terms up to the seventh degree.

Page 351. Coefficients for sets of independent comparisons for 2, 3, 4, and 5 groups at equal intervals.