



Linear Algebra. by W. H. Greub

Review by: D. J. Sterling

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thinker, his relevant manuscript was probably destroyed by a literary executor who disapproved of atomism (as Kepler himself apparently did).

On p. 55, Mason gives a remarkable table of seven ranges of temperature, each having a characteristic shape for snowflakes (for instance, hollow prismatic columns between -50°C and -25°C , and again between -8°C and -5°C). This provides a striking justification for Kepler's theory that the shape of snowflakes is influenced by variations of temperature.

Whyte remarks (p. 57) that, "in the *New Year's Gift* we observe a mind capable both of defining a mathematical problem in physics [why snowflakes are hexagonal] centuries before it became ripe for solution, and of experiencing a divine magic in two words, *facultas formatrix*. There is no contradiction here. Kepler's attitude is fundamentally natural and truly fertile. He displays that empirical mysticism which is indispensable to science . . ."

H. S. M. COXETER, University of Toronto

Linear Algebra. By W. H. Greub. Third edition. Springer-Verlag, New York, 1967. xii+434 pp. \$9.80. (Telegraphic Review, Jan. 1968.)

This tersely written text is a presentation of linear algebra ". . . based on an axiomatic treatment of linear spaces." The new material in the third edition affords a better balance between modern algebraic interests and traditional linear algebra. Working with vector spaces over arbitrary fields of characteristic zero whenever possible and assuming finite dimensionality only when necessary, the author gives comprehensive treatment to many topics including non-associative and graded algebras, inner product spaces, unitary spaces, and polynomial algebras. Masterful use of determinant functions and their duals makes the computational treatment palatable and even delightful in the case of volumes, cross products in oriented three space, and the relationship between rotations in three space and the quaternion algebra. In addition to the usual material on cyclic decompositions and canonical forms, the last chapter on linear transformations treats semi-simple transformations and commutative sets of semi-simple transformations. Problem material at the end of each section nicely supports the text, but for the most part is not suitably graded, i.e., many sections include too few *moderately* difficult problems.

While based on an axiomatic treatment of vector spaces the text (after the three introductory chapters) is not a formal presentation of linear algebra. A format of short crisp sections broken down into subsections devoted to a single idea makes the exposition quite readable. But with only a few exceptions derived statements have not been dignified by the name "theorem . . ." or "proposition . . .", nor have they been separated from their proofs or derivations by any typographical device. Consequently the novice will have some difficulty focusing upon and sorting the wealth of information presented. Schur's lemma (problem 8, p. 54) is missing the essential hypothesis that the spaces E and F are irreducible with respect to S_E and S_F .

D. J. STERLING, Bowdoin College

Exercises in Probability and Statistics for Mathematics Undergraduates. By N. A. Rahman (University of Leicester). Hafner, New York, 1967. x+307 pp. \$10.50. (Telegraphic Review, Feb. 1968.)

With textbooks becoming more abstract and less oriented toward problems and applications, there is a growing need for workbooks and problem collections. This one contains over 400 problems related to a full year undergraduate course at the post calculus level. The coverage is broader than most courses and includes the use of simple difference equations and generating functions, joint and simple derived distributions, tests, inference, bivariate correlation and regression, characteristic functions and their use in deriving sampling distributions explicitly.

At the back of the book there are answers and hints or sketches of solutions to all the